VOLUME 12 · NUMBER 1 · *January 1957*

Geriatrics

DEVOTED TO DISEASES AND PROCESSES OF AGING

Thoracic Emergencies in the Elderly 1

Influence of Diet on Serum Lipoprotein Levels 7

SYMPOSIUM: Physiologic Aspects of Aging 18

Effects of Aging on (1) Brain Composition, (2) Physical Fitness and Cardiovascular Functions, and (3) Physiologic Processes

New Department: Queries and Therapeutic Notes 60

Complete table of contents on page 3A

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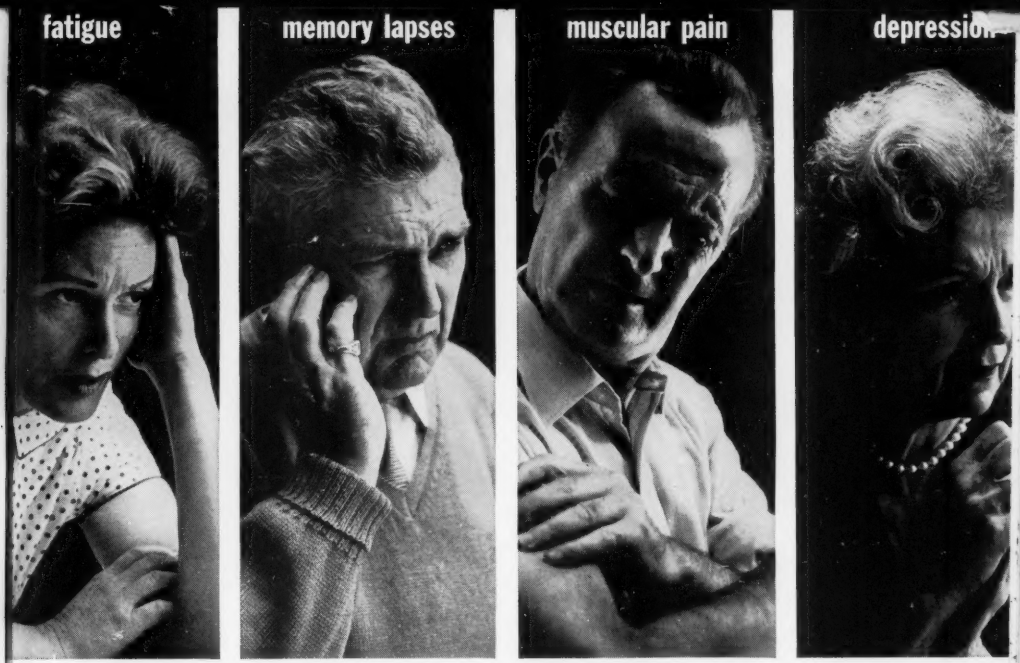

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References: **1.** McGavack, T. H.: Geriatrics *5*:151 (May-June) 1950. **2.** Masters, W. H.: Obst. & Gynec. *8*:61 (July) 1956. **3.** Kimble, S. T., and Stieglitz, E. J.: Geriatrics *7*:20 (Jan.-Feb.) 1952. **4.** Kountz, W. B., and Chieffi, M.: Geriatrics *2*:344 (Nov.-Dec.) 1947. **5.** Birnberg, C. H., and Kurzrok, R.: J. Am. Geriatrics Soc. *3*:656 (Sept.) 1955.

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Geriatrics

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Volume 12
Number 1

CONTENTS • *January 1957*

Intrathoracic Emergencies in the Aged
DUANE CARR, M.D. 1

Influence of Dietary Factors Upon Human Serum Lipoprotein Concentrations
ALEX V. NICHOLS, PH.D., VIRGINIA DOBBIN, B.S., and JOHN W. GOFMAN, M.D., PH.D. 7

Symposium: Physiologic Aspects of Aging
Foreword
THOMAS T. TOURLENTES, M.D. 18

Brain Composition During the Whole Life Span
WILLIAMINA A. HIMWICH, PH.D., and HAROLD E. HIMWICH, M.D. 19

Changes of Physical Fitness and Cardiovascular Functions With Age
ERNST SIMONSON, M.D. 28

Age Changes in Some Physiologic Processes
NATHAN W. SHOCK, PH.D. 40

Postural Dizziness in the Aged
E. J. ORMIA, M.D., and M. KOSKENOJA, M.D. 49

Practical Treatment of Hypothyroidism in the Elderly Patient (*Queries and Therapeutic Notes*)
S. MARX WHITE, M.D. 60

Recruiting the Professional Nurse to the Nursing Home Setting (*Sociomedical Progress*)
PHILIP TAIETZ, PH.D., and BERT L. ELLENBOGEN, PH.D. 62

Myasthenia Gravis (*Clinical Report*)
WALTER GANADO, M.D., M.R.C.P. 66

Recognition of Thoracic Emergencies (*Editorial*)
WALTER C. ALVAREZ, M.D. 69

The Biology of Aging (*Editorial*)
CHAUNCEY D. LEAKE, PH.D. 70

Departments

Looking forward 9A
Queries and Therapeutic Notes . . . 60
Sociomedical Progress 62
Clinical Report 66
Editorial 69
Book Reviews 71
Digests from Current Literature . . 73
Activities and Announcements 77
Conference Reports 78
Manufacturers' Activities 53A

GERIATRICS is published monthly at 84 South Tenth Street, Minneapolis 3, Minnesota by Lancet Publications, Incorporated. Subscription rates: $8.00 a year, 75c a copy; foreign, $9.00 a year, 85c a copy. Entered as second class matter February 14, 1946, at the post office at Minneapolis, Minnesota, under the act of March 3, 1879.

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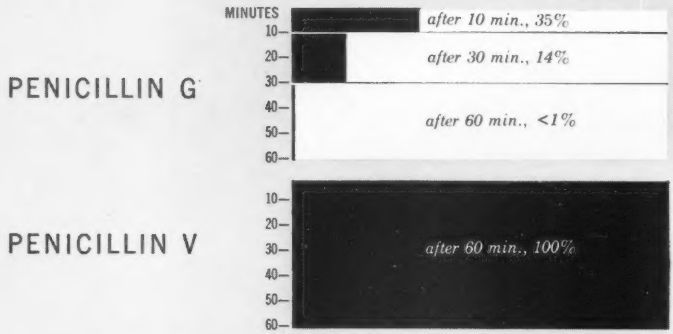

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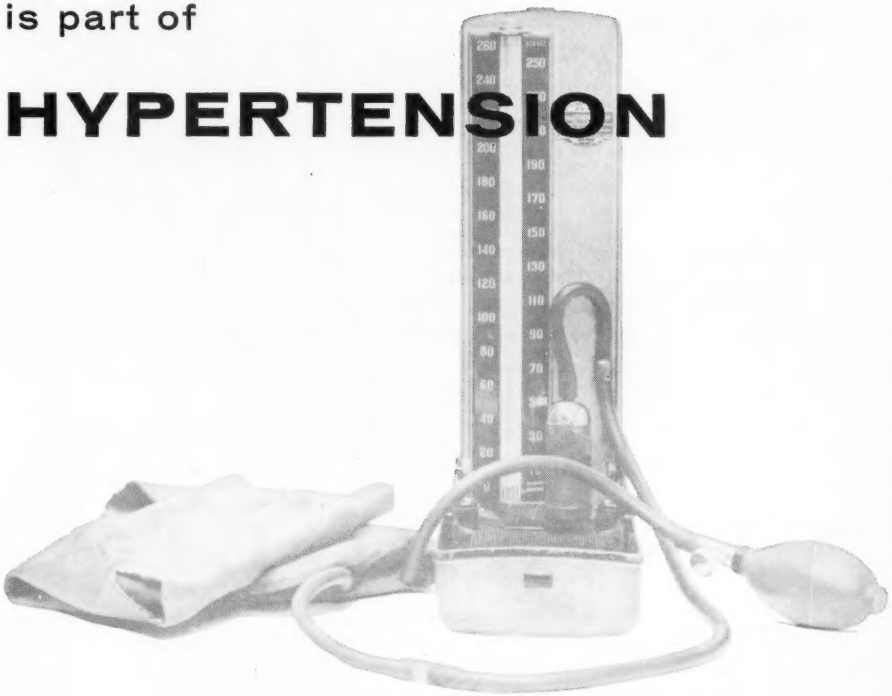

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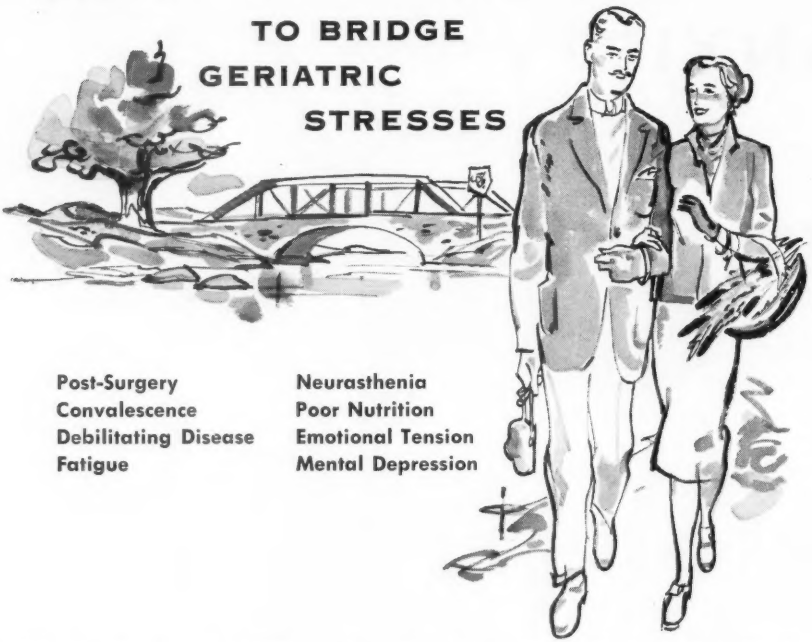

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. . . looking forward

• *Overweight, Obesity, and Coronary Heart Disease* are often associated in the layman's mind, although available evidence is inconclusive that overweight is an important factor in the development of coronary heart disease, according to Josef Brozek and Ancel Keys of the Laboratory of Physical Hygiene at the University of Minnesota, writing in the February issue of *Geriatrics*. They stress that additional research is needed to assess more precisely the role of "overweight," "obesity," and the individual difference in skeletal proportions and the distribution of soft tissues.

• E. J. Orma and M. Koskenoja of the Research Center for the Aged, Finnish Gerontological Society, Helsinki, Finland, consider the problem of *Dizziness Attacks and Continued Dizziness in the Aged*. In a study of 45 geriatric patients suffering from dizziness attacks, they discovered that about half of the attacks were central neurologic; 18 per cent, otologic; 11 per cent, cardial; and another 11 per cent, postinfectional. In neurologic dizziness attacks, the neurologic symptoms are often light and transient and thus are labeled "a small apoplexy" type. Continuous dizziness appears in those with extensive, diffuse brain lesions.

A second symposium from the Conference on Aging held at Galesburg, Illinois, on May 5, 1956, is presented under the title, "Psychiatric Aspects of Aging." The symposium includes the following authors and papers.

• In his *Definition of the Geriatric Patient*, Kurt Wolff, chief of the geriatric section, Osawatomie State Hospital, Kansas, points out that the geriatric patient represents a psychologic and biologic entity as well as a sociologic problem. The psychologic factors stem from decline of intellectual faculties and lack of emotional equilibrium; the biologic factors from chronic brain damage and other organic disturbances. Pathologists, psychologists, internists, physiologists, and psychiatrists must collaborate to solve the problems of the geriatric patient.

• When the aging person overcompensates for his deficiencies by asserting his importance with psychologic denial, strenuous reassertion of status and control, or by playing a helpless role, then personal, familial, and social tragedies may ensue, according to Jules H. Masserman, professor of neurology and psychology, Northwestern University School of Medicine. However, understanding of *The Psychodynamics of Aging* and helping the elderly preserve their human dignity and cultural participation may prevent such situations.

• Otto L. Bettag, director of the Illinois Department of Public Welfare, discusses the increasing *Hospitalization of Persons 65 or Older in the Illinois State Hospitals for the Mentally Ill*. The elderly schizophrenic patient, probably admitted early in life, the arteriosclerotic, and the senile patient comprise the aged population in hospitals. The combination of growing population, increased life expectancy, and the tendency of families to relegate their elderly members to state care, may indicate that our state mental hospitals are destined to become homes for the aged.

• Aging is a common experience, yet our culture places an exaggerated premium on youth, and hinders the process of emotional maturation with handicaps and obstacles in the form of sociologic factors, says Maurice B. Linden, director of the division of mental health, Department of Public Health, and regional director of the Commonwealth Mental Health Center in Philadelphia. He warns that the *Effects of Social Attitudes on Mental Health of Aging* are too often calamitous; cultural rejection, leading to self-rejection, may usher in senility.

• *The Psychiatric Complications of the Aging Period* include many mental breakdowns, often caused by collapse of the personality defenses under stress of conditions other than organic disease, according to Francis J. Gerty, professor of psychiatry, University of Illinois, and director of the Psychiatric Division, Illinois Neuropsychiatric Institute, Chicago. States of depression and anxiety occur frequently. Adequate treatment demands adequate knowledge of the sufferer's ability to bear stress in terms of his personality.

For these and other articles, abstracts, reviews, and special features, read every issue of Geriatrics.

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[1]Busse, E.A.: Treatment of Rheumatoid Arthritis by a Combination of Cortisone and Salicylates. Clinical Med. *11*:1105.

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1. Klemme, H. L.: Clin. Med., October, 1956.

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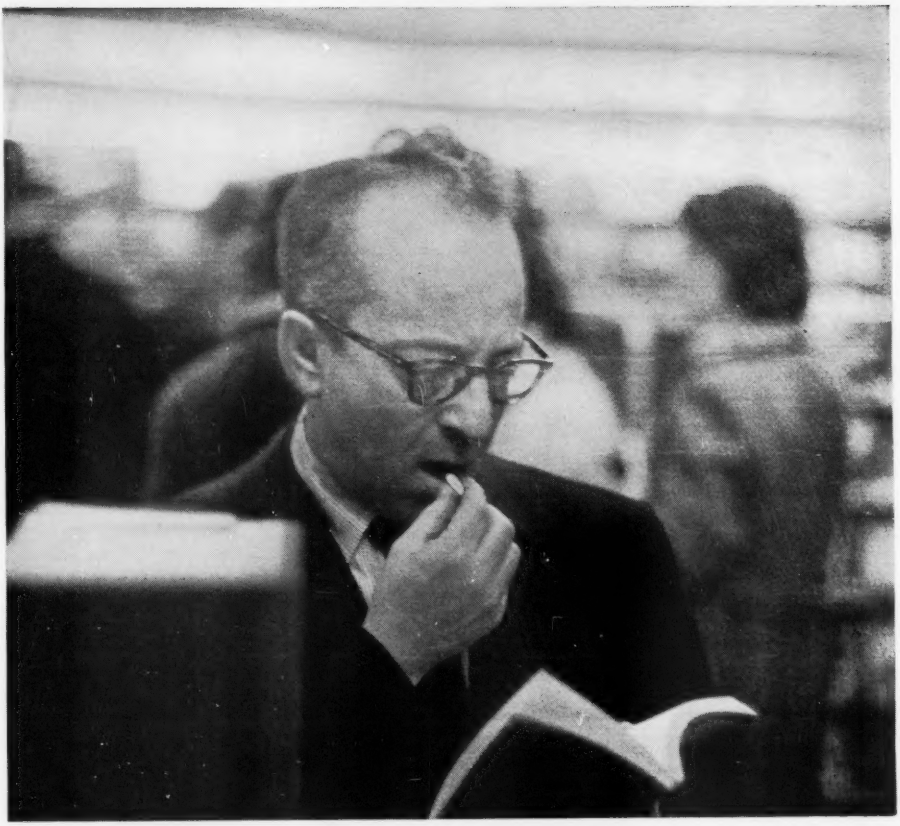

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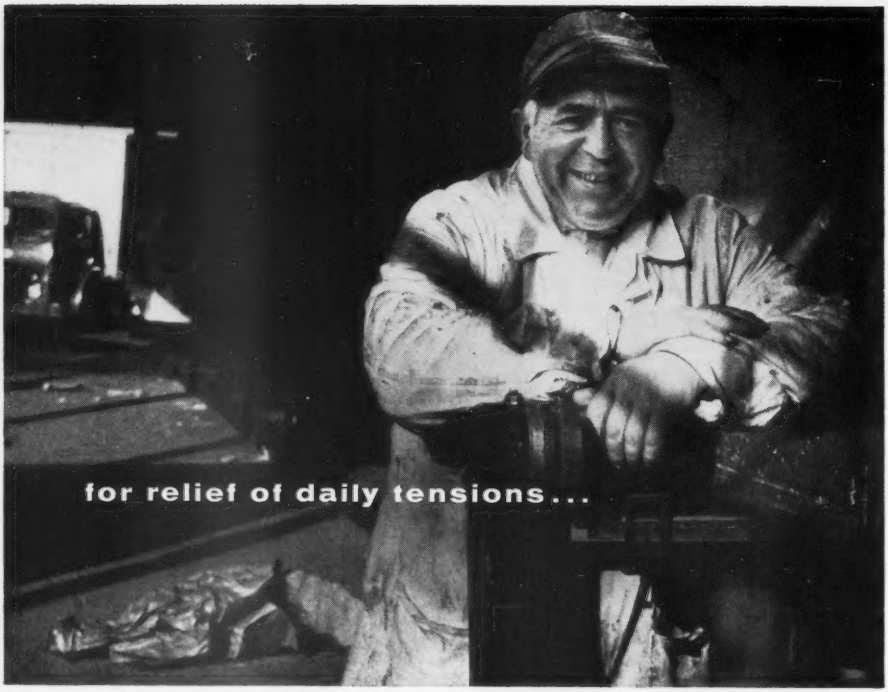

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*Ferguson, J. T.: J. Am. Geriatrics Soc. *4*:1080, 1956.

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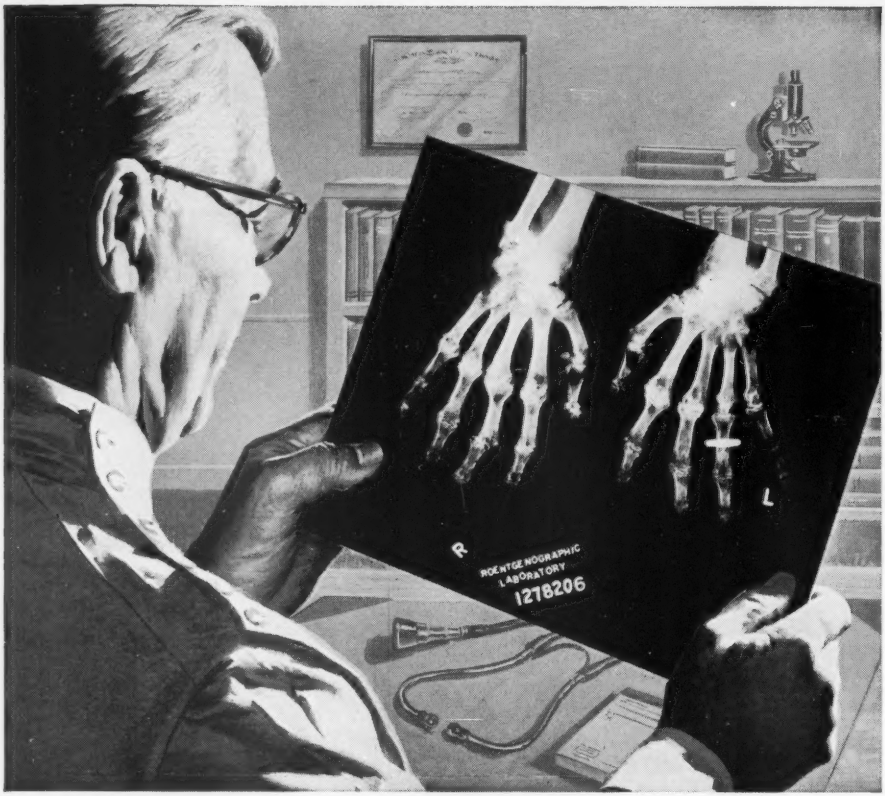

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1. J.A.M.A. 159:645 (Oct. 15) 1955.
2. J.A.M.A. 158:386 (June 4) 1955.

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A Better Antihypertensive

. . . because among all Rauwolfia preparations Rauwiloid (alseroxylon) is maximally effective and maximally safe . . . because least dosage adjustment is necessary . . . because the incidence of depression is less . . . because up to 80% of patients with mild labile hypertension and many with more severe forms respond to Rauwiloid alone.

A Better Tranquilizer, too

. . . because Rauwiloid's *nonsoporific* sedative action relieves anxiety in a long list of unrelated diseases not necessarily associated with hypertension . . . without masking of symptoms . . . without impairing intellectual or psychomotor efficiency.

Dosage: Simply two 2 mg. tablets at bedtime. After full effect one tablet suffices.

Best first step when more potent drugs are needed

Rauwiloid is recognized as basal medication in all grades and types of hypertension. In combination with more potent agents it proves synergistic or potentiating, making smaller dosage effective and freer from side actions.

Rauwiloid®+Veriloid®

In moderate to severe hypertension this single-tablet combination permits long-term therapy with dependably stable response. Each tablet contains 1 mg. Rauwiloid and 3 mg. Veriloid. Initial dose, 1 tablet t.i.d., p.c.

Rauwiloid®+ Hexamethonium

In severe, otherwise intractable hypertension this single-tablet combination provides smoother, less erratic response to hexamethonium. Each tablet contains 1 mg. Rauwiloid and 250 mg. hexamethonium chloride dihydrate. Initial dose, ½ tablet q.i.d.

Riker LOS ANGELES

treat

depression

fatigue

hypochondriasis

- *somatically*
- *psychically*
- *safely*

with *new*

Dexazyme®

For the first time in the treatment of depression, improvement in mentation *and* metabolism *and* mood is now possible with a single therapy—**Dexazyme.**

Dexazyme elevates mood by combining low, *safer* dosages of dextro-amphetamine with Pentrazol.*

Dexazyme improves mentation and clarity of consciousness through action of Pentrazol *and* niacin.

Dexazyme enhances metabolism by providing niacin, thiamine, riboflavin and ascorbic acid.

*brand of pentylenetetrazol

℞ **Dexazyme** #60 Sig.: 1 (or 2) capsules, t.i.d. with meals

GRAY PHARMACEUTICAL CO., INC
NEWTON 58, MASSACHUSETTS

bowel rehabilitation for the aged

- neuromuscular action mediated through Auerbach's plexus
- normal bowel motility restored
- soft, well-formed stools evacuated
- dosage may be gradually reduced and therapy eventually discontinued

"...the results obtained with Senokot in our old age patients were very good..."

—Glass, G. B. J.: Personal communication, 1956.

NEW SPECIFIC
NEUROPERISTALTIC

IN CONSTIPATION

Natural Bowel Corrective

Senokot®

Brand of standardized concentrated active principles of Cassia acutifolia pods

TABLETS / GRANULES

DOSAGE: individualized—one level teaspoonful of granules (or two tablets) at bedtime.
GRANULES: cocoa-flavored, in 8 and 4 ounce containers.
TABLETS: small and easy to swallow, in bottles of 100.

PF *The Purdue Frederick Company* DEDICATED TO PHYSICIAN AND PATIENT SINCE 1892
135 CHRISTOPHER ST., NEW YORK 14, N. Y.

THE CASE FOR EARLY CONTROL OF HYPERTENSION[1]

In the Guest Editorial for GP in July, Dr. Edward D. Freis reexamines two major questions:

1. Should Hypertension Be Treated Early?

Freis finds the case for early treatment to rest on cause-and-effect evidence: "... high pressure, ... *and nothing else but this high pressure,* creates many if not all the organic manifestations that lead to the final disability and eventual death of the patient." The "evidence presents a cogent argument for the treatment of hypertension early before vascular damage has occurred."[1]

2. What Is the Role of the More Potent Agents? "... the evidence ... suggests that the technique [for the effective and safe use of such agents as ANSOLYSEN] should be more widely learned and employed. Furthermore, ... the patients with early hypertension, especially those without renal damage, are far more easily controlled, with fewer side effects, than the patients with advanced hypertension."[1]

Freis cautions that these views are not presented as dogma; "... they have been developed to show the other side of an argument that seems to have many points in its favor."[1]

1. Freis, Edward D.: Guest Editorial. GP *14*:72 (July) 1956.

ANSOLYSEN®
TARTRATE Pentolinium Tartrate
Lowers Blood Pressure

Wyeth®
Philadelphia 1, Pa.

NEW

for your Rheumatoid Arthritis patient

for the objective symptoms
for the subjective distress

the first and only ataraxic-corticoid

Ataraxoid*

prednisolone and hydroxyzine

provides the anti-rheumatic, anti-inflammatory action of the most effective steroid, STERANE,® complemented by the superior central tranquilizing effects of ATARAX.® Minimal disturbance of fluid and electrolyte metabolism; no mental fogging or major toxicity in ataractic action.

FOR UNMATCHED RESPONSE AND MANAGEMENT IN RHEUMATOID ARTHRITIS... AS IN OTHER COLLAGEN DISEASES, BRONCHIAL ASTHMA, INFLAMMATORY DERMATOSES.

Supplied: Each green, scored ATARAXOID Tablet contains 5 mg. prednisolone (STERANE) and 10 mg. hydroxyzine hydrochloride (ATARAX). Bottles of 30 and 100.

PFIZER LABORATORIES
Division, Chas. Pfizer & Co., Inc.
Brooklyn 6, New York

Pfizer

*Trademark

High concentration

Topical Salicylate Therapy

for safer, more effective relief of rheumatic pain

High concentration topical salicylate-menthol therapy (BAUME BENGUÉ) offers safe, penetrating relief of painful joints and muscles caused by overexertion.

■ *Topical salicylate therapy is being rediscovered* as perhaps the safest, most effective remedy for aching joints and muscles.

Increased percutaneous absorption of salicylate, with enhanced blood flow through the affected tissue is provided by BAUME BENGUÉ, offering up to 2.5 times more methyl salicylate and menthol than other topical salicylate preparations. In arthritis, myositis, bursitis and arthralgia, BAUME BENGUÉ induces deep, active hyperemia and local analgesia.

Lange and Weiner suggest the term "hyperkinemics" to describe preparations such as BAUME BENGUÉ which produce blood flow *through a tissue area*. They point out that hyperkinemic effect, as measured by thermoneedles, may extend to a depth of 2.5 cm. below the surface of the skin. (J. Invest. Dermat. *12*:263, May, 1949.)

Two strengths: *regular* and *children's*.

THOS. LEEMING & CO., INC.
155 E. 44th Street, New York 17, N.Y.

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ANALGÉSIQUE

Menthol-induced hyperemia plus high local concentration of salicylate has been rediscovered as one of the most promptly effective remedies for rheumatoid discomfort due to exposure.

better tasting

better absorbed

better utilized

HOMAGENETS®*

Homagenets provide multivitamins in the same way as do the most nutritious foods. By a unique process, the vitamins are homogenized, then fused into a solid, highly palatable form. Compare the taste of Homagenets with other vitamin preparations.

Homogenization presents both oil and water soluble vitamins in microscopic particles. This permits greater dispersion of the vitamins—thus better absorption and utilization. And the flavorful base assures patient acceptance.

*U.S. Pat. 2676136. Other Pat. Pending

Advantages—

Better absorption, better utilization

Excess vitamin dosage unnecessary

Pleasant, candy-like flavor

No regurgitation, no "fishy burp"

May be chewed, swallowed or dissolved in the mouth

Three formulas:

Prenatal Pediatric Therapeutic

Send for samples of Homagenets. Taste them, and compare.

The S. E. MASSENGILL Company

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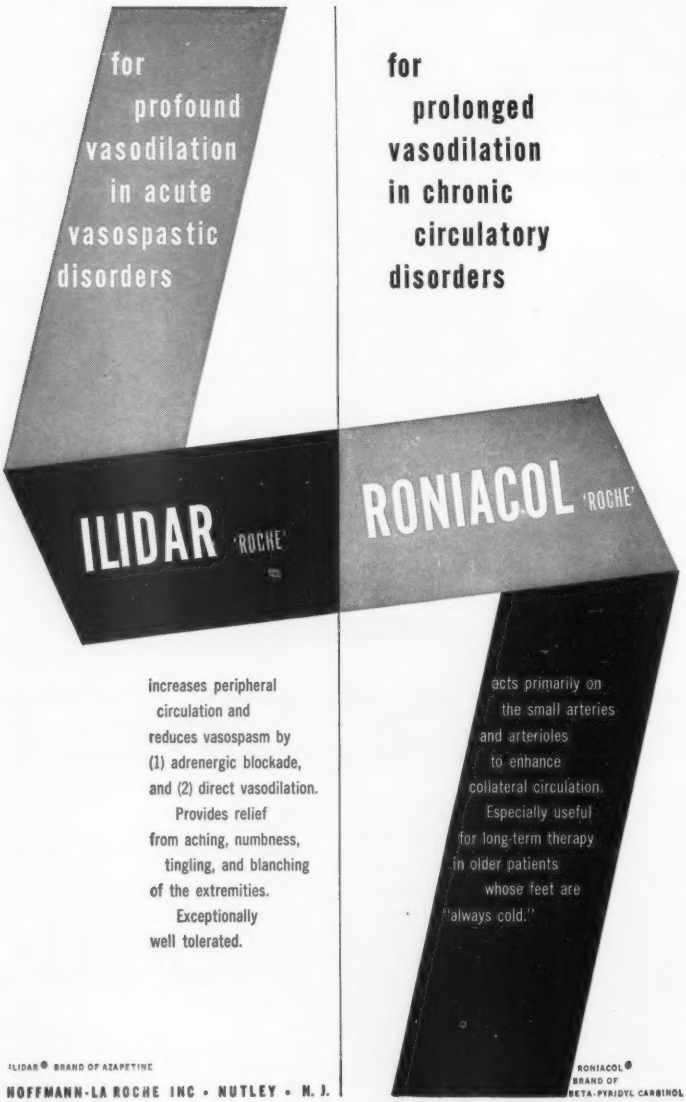
for profound vasodilation in acute vasospastic disorders
for prolonged vasodilation in chronic circulatory disorders
ILIDAR 'ROCHE'
RONIACOL 'ROCHE'
increases peripheral circulation and reduces vasospasm by (1) adrenergic blockade, and (2) direct vasodilation.
Provides relief from aching, numbness, tingling, and blanching of the extremities.
Exceptionally well tolerated.
acts primarily on the small arteries and arterioles to enhance collateral circulation.
Especially useful for long-term therapy in older patients whose feet are "always cold."
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prior to
plastic pelvic surgery

in atrophic
or senile vagini
and pruritus vulvae

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Ortho®
Dienestrol
Cream
vaginal estrogen therapy

Ortho

To help maintain vigorous muscle and nerve tone...
To improve vascular and cerebral vitality...
SIG: 2 CAPS DAILY
BOTTLES OF 100 AND 1000.
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100 CAPSULES
GERALIN
ULTRA - COMPREHENSIVE DIETARY SUPPLEMENT FOR THE MIDDLE AND OLDER AGED GROUPS
Vitamins – Minerals
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For Formula, Dosage and Minimum Daily Requirements, see sides and back of carton.
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100 CAPSULES
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GERIATRIC DIETARY SUPPLEMENT
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before

pathetic, atonic, antisocial

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lert, animated, assured

with

Analeptone*

because when depression, mental confusion, emotional lability, irritability, or antisocial attitudes are part of the geriatric syndrome . . . an *analeptic* may be indicated rather than a tranquilizer. The gamut of symptoms caused by hypoxia are effectively relieved or reversed by the cerebral stimulation of ANALEPTONE elixir or tablets.

Formula—*Elixir*, 1 teaspoonful: pentylenetetrazol, 200 mg.; niacin, 100 mg.; Peptenzyme® Elixir q.s.—*Tablets*: pentylenetetrazol, 100 mg.; niacin, 50 mg.; pepsin 1:10,000, 5 mg. Dosage—½ to 1 teaspoonful or 1 to 2 tablets, one to three times per day. Available—in bottles of 8 fl. oz. or 100 tablets.

*T.M.

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increasingly preferred

by physicians

strikingly effective

for patients

in rheumatoid arthritis

METICORTEN*

(PREDNISONE)

excellent relief of pain, swelling, tenderness; diminishes joint stiffness—facilitates early physical therapy—expedites rehabilitation

dietary regulations usually unnecessary

minimizes incidence of electrolyte imbalance

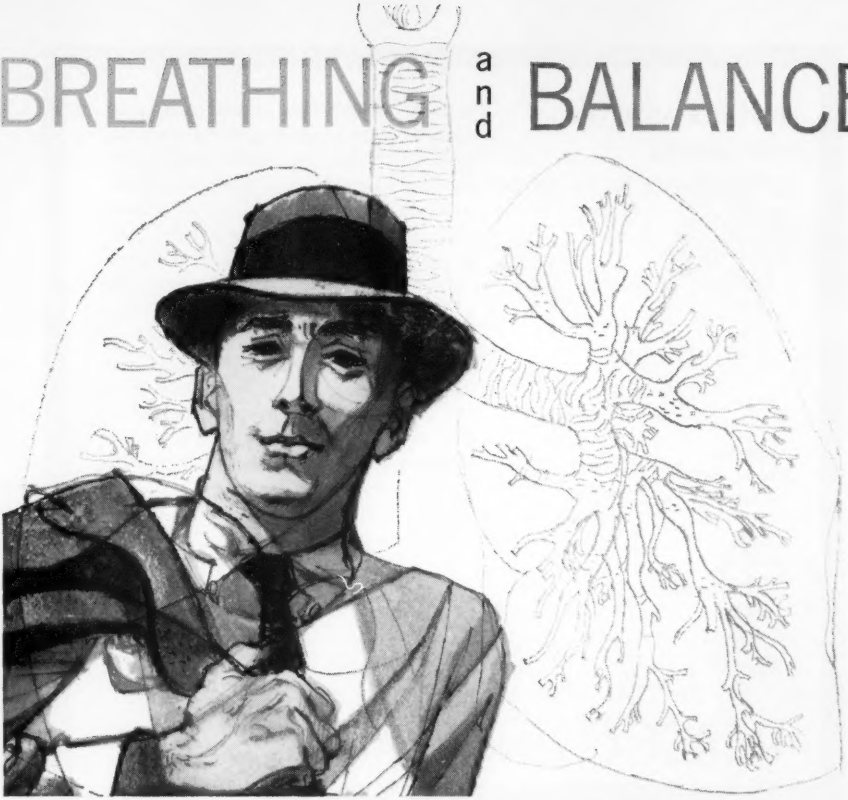
1, 2.5 and 5 mg. tablets

METICORTEN,* brand of prednisone.

*T. M.

MC-J-2376

BREATHING and BALANCE



in bronchial asthma

Sterane®

brand of prednisolone

whenever corticosteroids are indicated

provides restoration of breathing capacity — Relief of symptoms [bronchospasm, cough, wheezing, dyspnea] is maintained for long periods with relatively small doses.*

minimal effect on electrolyte balance — "in therapeutically effective doses . . . there is usually no sodium or fluid retention or potassium loss."* Lack of edema and undesirable weight gain permits more effective therapy particularly for those with cardiac complications.

Supplied: White, 5 mg. oral tablets, bottles of 20 and 100. Pink, 1 mg. oral tablets, bottles of 100. Both are deep-scored.

*Schwartz, E.: New York J. Med. 56:570, 1956.

PFIZER LABORATORIES, Brooklyn 6, New York
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IN SENILE ANXIETY... PRONOUNCED IMPROVEMENT IN 51 OF 54

CLINICAL REPORT. New ATARAX calms tense patients without impairing mental alertness. Shalowitz tested ATARAX in 54 patients with senile anxiety. "Good to excellent improvement was shown in 51 of the 54 patients treated. No untoward effects on liver, blood or nervous system were observed. All patients treated, except those who responded poorly, (were) not as fidgety after therapy, and were able to sleep better."[1]

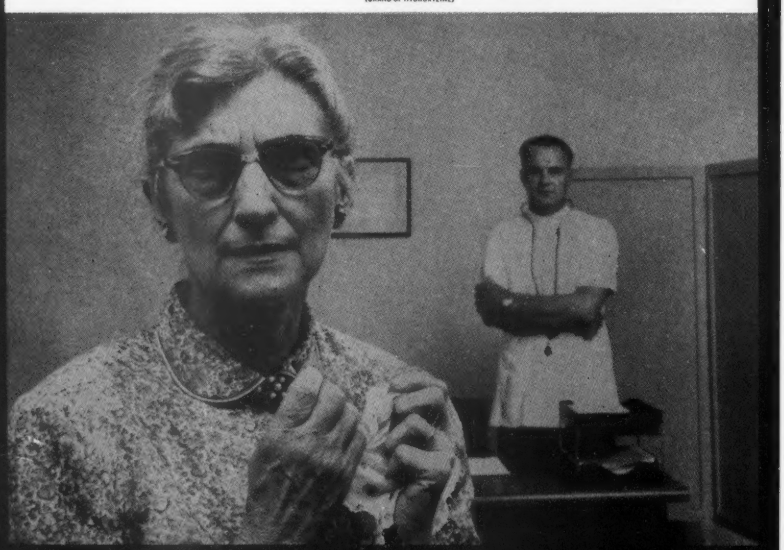
ADMINISTRATION. Although Shalowitz found the optimal dose was 10 mg. tablets three or four times a day, some patients may respond better on the 25 mg. tablets, b.i.d. or t.i.d. Now also available in syrup form, containing 10 mg. ATARAX per tsp. In tiny 10 mg. (orange) and 25 mg. (green) tablets, bottles of 100. ATARAX Syrup in pint bottles.

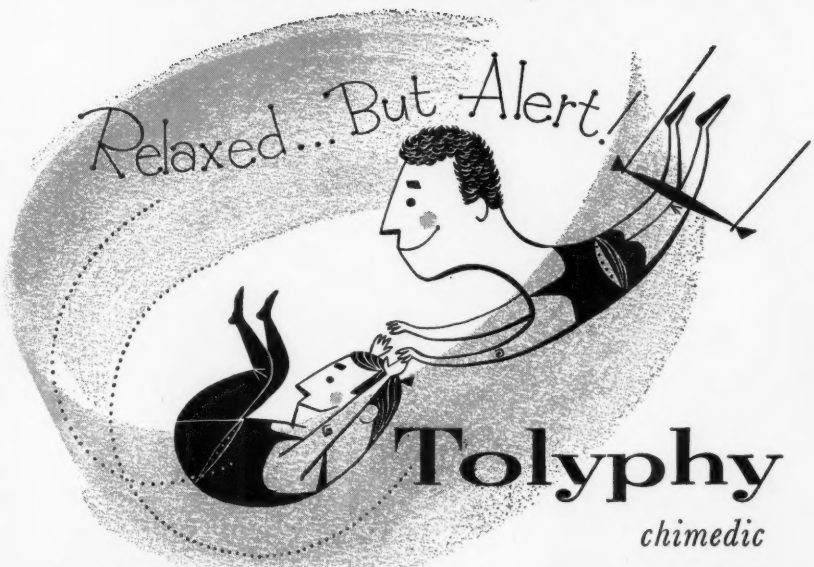
NOW IN CORDIAL-LIKE FORM

1. Shalowitz, M.: Hydroxyzine: a new therapeutic agent for senile anxiety states. Geriatrics 11:312 (July) 1956.

Chicago 11, Illinois

PEACE OF MIND ATARAX® SYRUP
(BRAND OF HYDROXYZINE)





Smooth and pain-free range of motion with complete muscle relaxation is accomplished by Tolyphy without loss of muscle tone or depressant effect on the central nervous system.

Tolyphy combines:

a. Powerful spasmolytic action of Tolyspaz (Chimedic brand of mephenesin) with

b. Established neuromuscular effects of physostigmine and atropine

to relieve pain, increase mobility, restore muscle strength and function.

Use Tolyphy Chimedic for safe, effective relaxation of muscle spasm or neuromuscular hyperirritability in a wide range of conditions such as

- ARTHRITIS
- FIBROSITIS
- TORTICOLLIS
- BURSITIS
- MYOSITIS
- TENDINITIS

For a clinical trial with your own patients, send for free samples and literature on Tolyphy and Tolyspaz.

Tolyspaz (Chimedic brand of Mephenesin) is especially designed to correct emotional stress and anxiety tension states, without "clouding consciousness."[1]

[1] *J.A.M.A. 140:672 (June 25) 1949*

Please send me:

☐ Literature and samples of TOLYPHY

☐ Literature and samples of TOLYSPAZ

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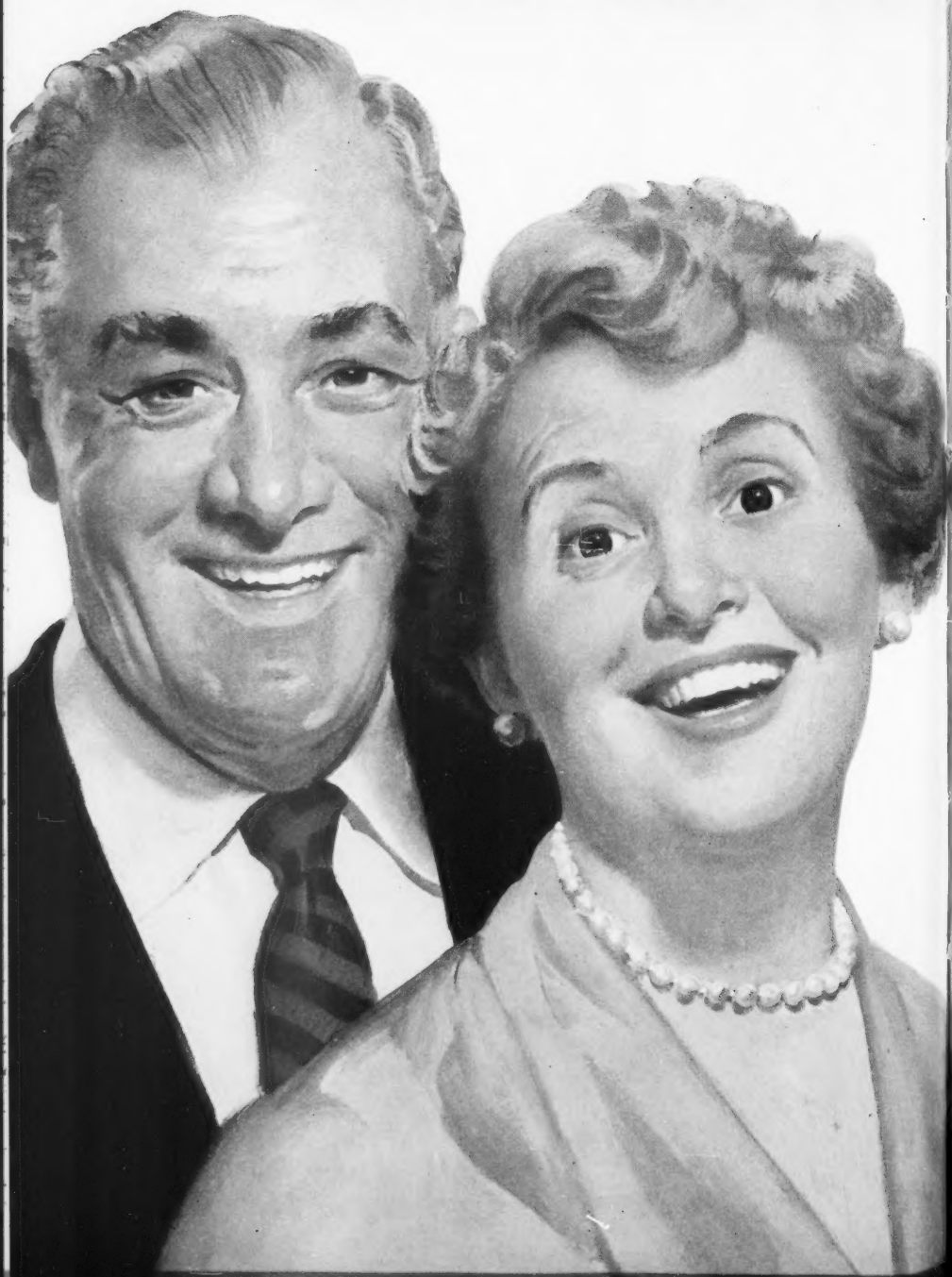
PACIFIC COAST BRANCH: 381 Eleventh St., San Francisco, Calif.

How to add life to



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good

e to your years

. . . and years to your life!

You've probably noticed it among your own acquaintances. Some people at 60 or even 70 seem to be doing more, and having more fun at it, than others who are 50—or even 40!

Chances are, if you could look closer into their lives you'd learn a few things. They chose the right parents. (Heredity has something to do with it.) They find joy in their work. (That has a *lot* to do with it.) And then you might find something else. You might discover that the people who live longest and enjoy life most are people who eat enough of the right kind of foods.

For a properly balanced diet, medical scientists tell us, can literally slow up the aging process. That means plenty of proteins—the building blocks that keep your body in a state of good repair. Vitamins and minerals—the protective foods which keep your eyes shining, your hair and skin in good condition . . . and your whole outlook on life brighter. Energy foods—the fuels your body has to burn to give you young vigor and enthusiasm.

This is not to say you have to eat a lot. In fact, as we grow older, we need less food. The important thing is to eat a *wide variety of the right foods.*

For instance—take a banana. Take it—peel it—eat it! It's satisfying and nourishing. Vitamins and minerals are there in well-balanced supply and wholesome natural sugars to give you energy. Slice a banana into a bowl and pour milk on it . . . you're adding proteins to keep your body in good repair, as well as riboflavin and bone-building calcium. There's a healthful bowlful! Easy to fix. Easy to eat. Easy to digest. In fact, doctors often recommend bananas in cases of severe digestive disturbances.

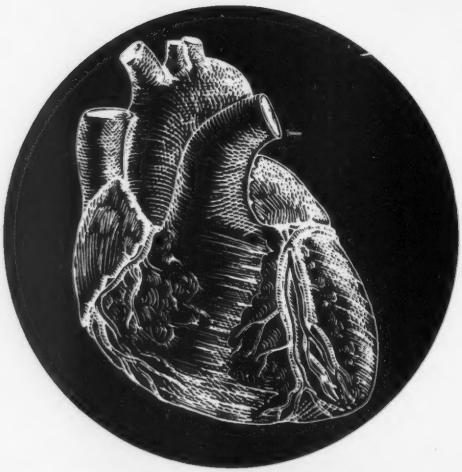
And you don't have to feel very hungry (or even to be very old) to enjoy this simple treat!

UNITED FRUIT COMPANY

FOR HEALTH, EAT AND ENJOY A PLENTIFUL VARIETY OF THE RIGHT FOODS

If you do not know what the "right" foods are, ask your doctor.

For free reprints of this advertisement,



'LANOXIN'* brand DIGOXIN

provides the

greater margin of safety

of a brief latent period

and optimum rate of elimination

for dependable
digitalization and maintenance

Tablets: 0.25 mg. (white) and 0.5 mg. (green)
Pediatric Elixir: 0.05 mg. in each cc.
Ampuls: 0.5 mg. in 2 cc.

*'Lanoxin' was formerly known as Digoxin 'B. W. & Co.' The new name has been adopted to make easier for everyone the distinction between digoxin and digitoxin.

BURROUGHS WELLCOME & CO. (U. S. A.) INC., *Tuckahoe, New York*

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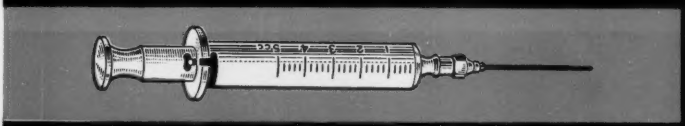


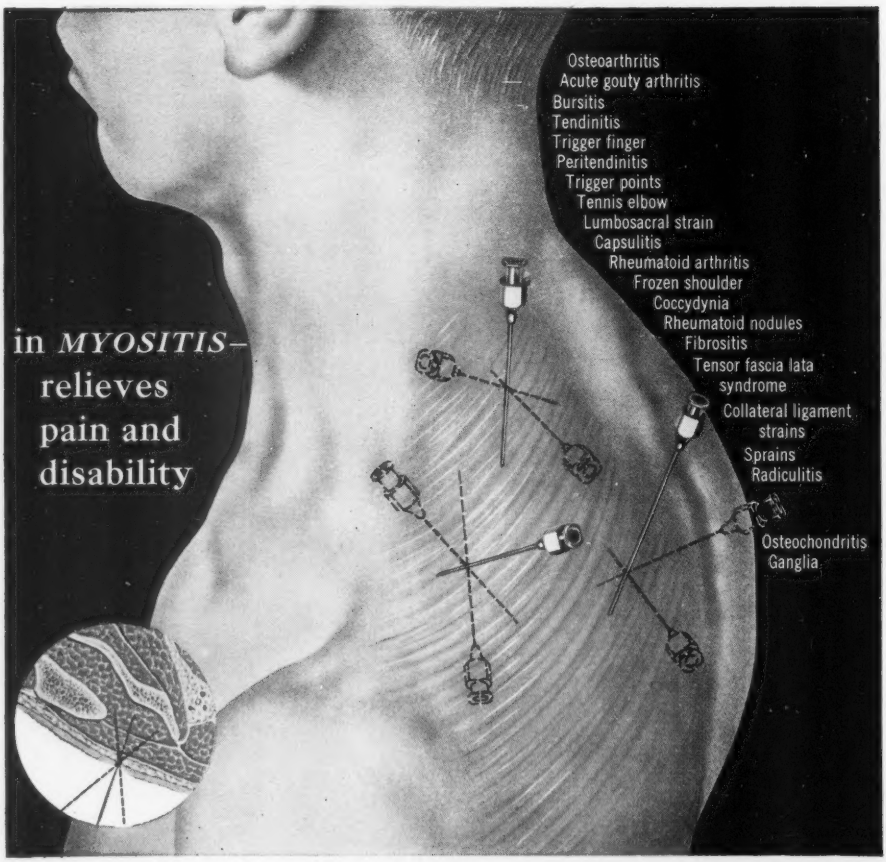
the most effective, longest lasting adrenocortical steroid yet developed for SOFT TISSUE, *intra-articular, and intra-bursal injection*

NEW

HYDELTRA®-T.B.A.

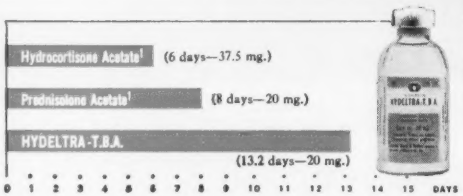
(Prednisolone *tertiary*-butylacetate, Merck)

for relief that lasts—longer



in *MYOSITIS*—
relieves
pain and
disability

Anti-inflammatory effect lasts longer than that provided by any other steroid ester


Hydrocortisone Acetate[1] (6 days—37.5 mg.)
Prednisolone Acetate[1] (8 days—20 mg.)
HYDELTRA-T.B.A. (13.2 days—20 mg.)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 DAYS

Dosage: the usual intra-articular, intra-bursal or soft tissue dose ranges from 20 to 30 mg. depending on location and extent of pathology.

Supplied: Suspension 'HYDELTRA'-T.B.A.—20 mg./cc. of prednisolone *tertiary*-butylacetate, in 5-cc. vials.

MERCK SHARP & DOHME
DIVISION OF MERCK & CO., INC.
PHILADELPHIA 1, PA.

1. Hollander, J. L., *Paper read at conference in New York City, May 31 and June 1, 1955*

NEW

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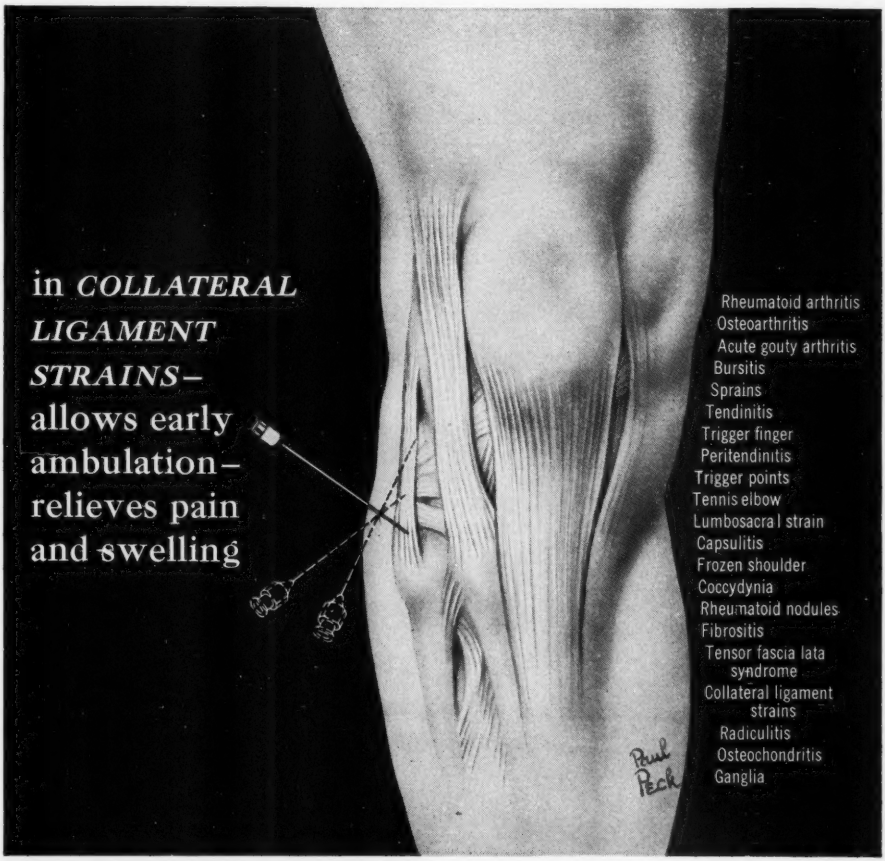
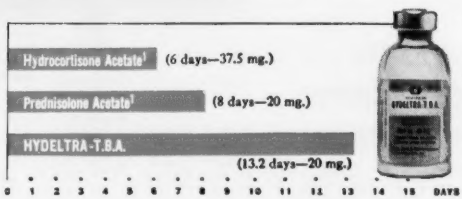
(Prednisolone *tertiary*-butylacetate, Merck)

for relief that lasts—longer



Duration of relief exceeds that provided by any other steroid ester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1. Hollander, J. L., *Paper read at conference in New York City, May 31 and June 1, 1955*

NEW

HYDELTRA®-T.B.A.

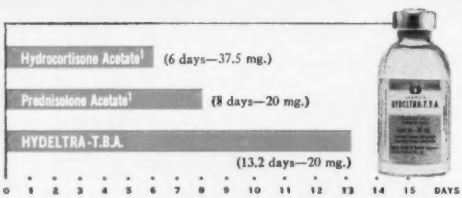
(Prednisolone *tertiary*-butylacetate, Merck)

for relief that lasts—longer

in *TENOSYNOVITIS*—
often frees
"locked"
tendons
without
need
for surgery

- Osteoarthritis
- Rheumatoid arthritis
- Acute gouty arthritis
- Bursitis
- Tendinitis
- Trigger finger
- Tenosynovitis
- Trigger points
- Tennis elbow
- Lumbosacral strain
- Capsulitis
- Frozen shoulder
- Coccydynia
- Rheumatoid nodules
- Fibrositis
- Tensor fascia lata syndrome
- Collateral ligament strains
- Sprains
- Radiculitis
- Osteochondritis
- Ganglia

Anti-inflammatory effect lasts longer than that provided by any other steroid ester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MSD

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1. Hollander, J. L., *Paper read at conference in New York City, May 31 and June 1, 1955*

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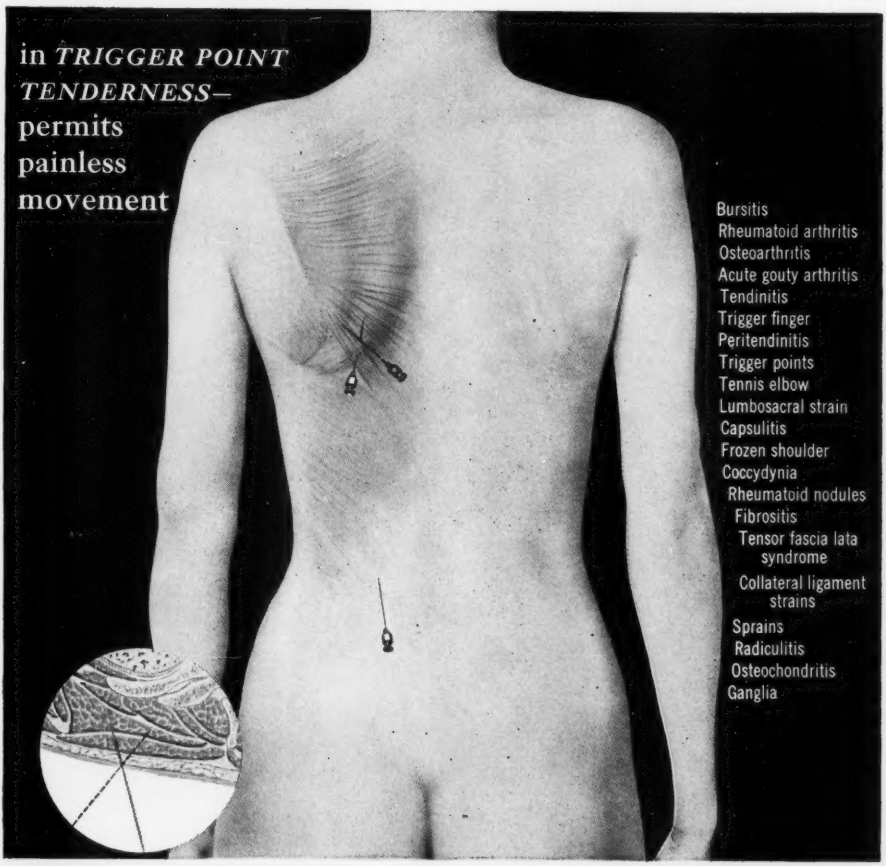
(Prednisolone *tertiary*-butylacetate, Merck)

for relief that lasts—longer

in *TRIGGER POINT TENDERNESS*—
permits
painless
movement



- Bursitis
- Rheumatoid arthritis
- Osteoarthritis
- Acute gouty arthritis
- Tendinitis
- Trigger finger
- Peritendinitis
- Trigger points
- Tennis elbow
- Lumbosacral strain
- Capsulitis
- Frozen shoulder
- Coccydynia
- Rheumatoid nodules
- Fibrositis
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- Sprains
- Radiculitis
- Osteochondritis
- Ganglia

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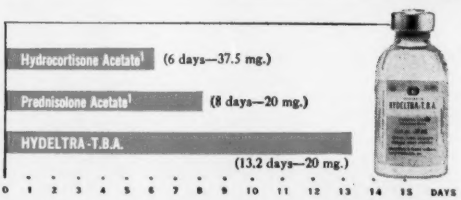
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Supplied: Suspension 'HYDELTRA'-T.B.A.—20 mg./cc. of prednisolone *tertiary*-butylacetate, in 5-cc. vials.

MSD

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PHILADELPHIA 1, PA.

1. Hollander, J. L., *Paper read at conference in New York City, May 31 and June 1, 1955*

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(Prednisolone *tertiary*-butylacetate, Merck)

for relief that lasts—longer

in *SPRAINS*—
reduces tenderness,
swelling and
limitation of motion

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- Acute gouty arthritis
- Bursitis
- Tendinitis
- Trigger finger
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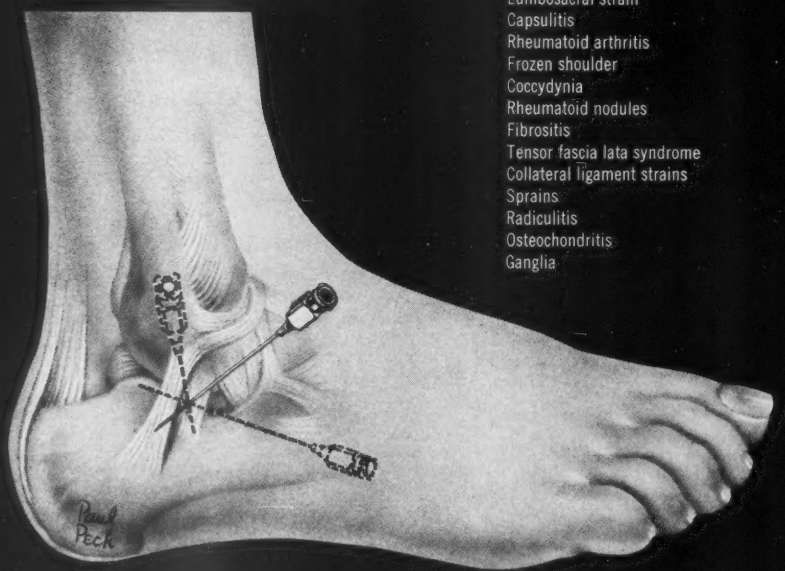
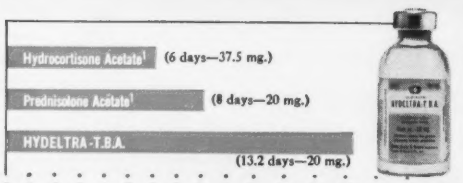
- Rheumatoid arthritis
- Frozen shoulder
- Coccydynia
- Rheumatoid nodules
- Fibrositis
- Tensor fascia lata syndrome
- Collateral ligament strains
- Sprains
- Radiculitis
- Osteochondritis
- Ganglia



Anti-inflammatory effect lasts longer than that provided by any other steroid ester


Hydrocortisone Acetate[1]
(6 days—37.5 mg.)
Prednisolone Acetate[1]
(8 days—20 mg.)
HYDELTRA-T.B.A.
(13.2 days—20 mg.)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 DAYS

Dosage: the usual intra-articular, intra-bursal or soft tissue dose ranges from 20 to 30 mg. depending on location and extent of pathology.

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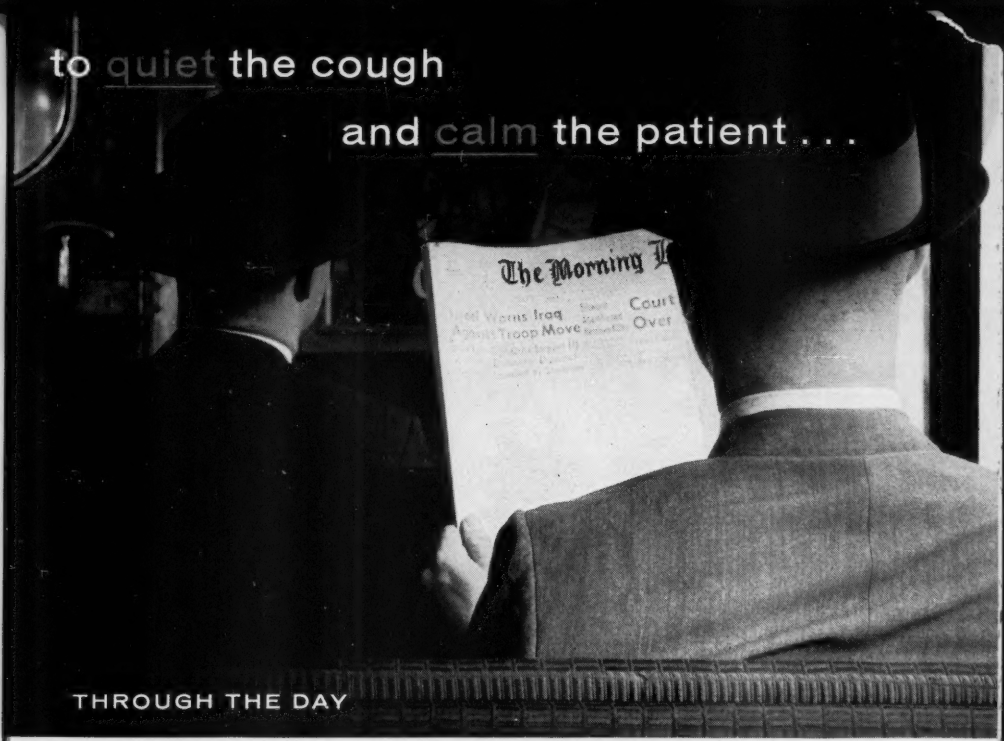
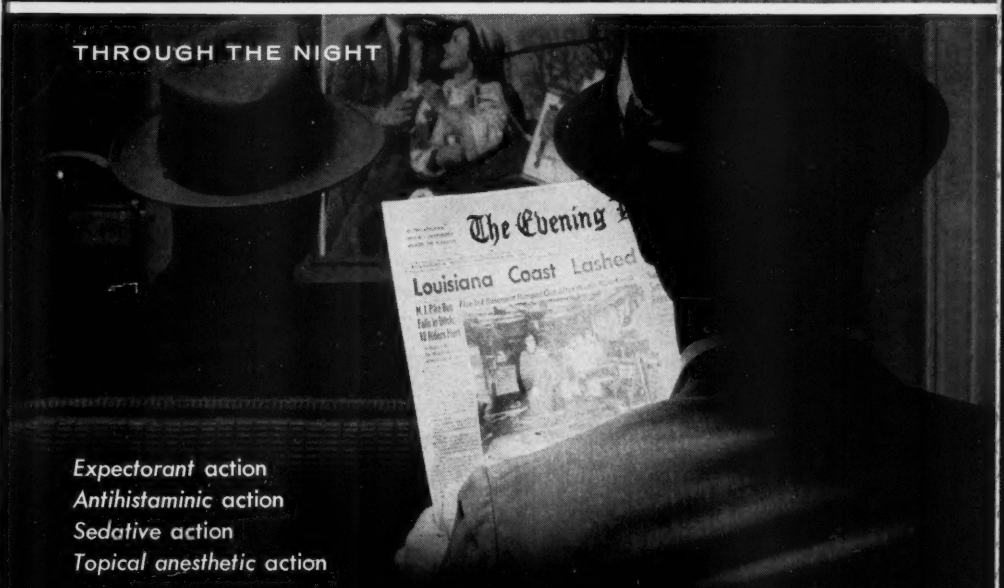
to quiet the cough

and calm the patient . . .



THROUGH THE DAY

THROUGH THE NIGHT



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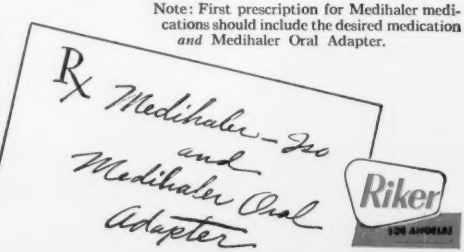
Note: First prescription for Medihaler medications should include the desired medication *and* Medihaler Oral Adapter.



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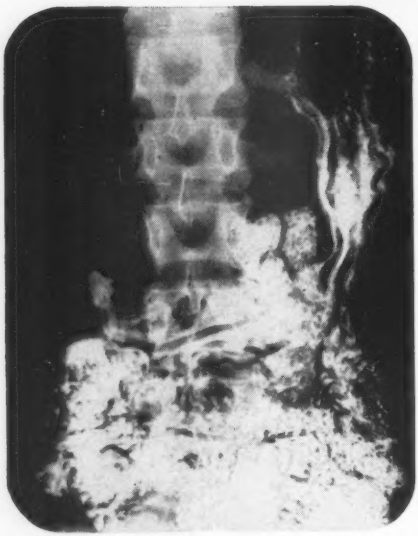
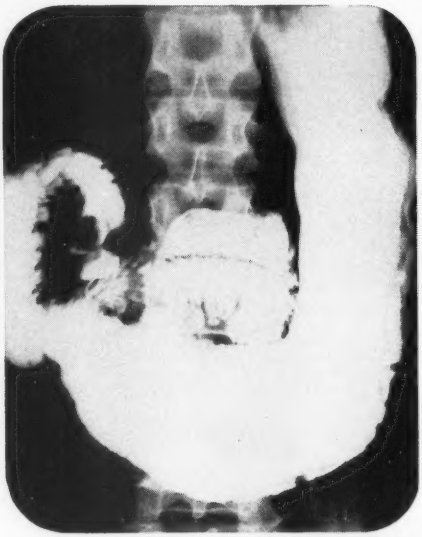


*Posterior-anterior film: definite hyperperistalsis with poor duodenal visualization.**



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This procedure has the additional advantage of demonstrating the patient's response to a given dosage of the drug.

G. D. Searle & Co., Chicago 80, Illinois, Research in the Service of Medicine.

*Roentgenograms courtesy of I. Richard Schwartz, M.D., Kings County Gastrointestinal Clinic, Brooklyn, N.Y.

SEARLE

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for biliary dyspepsia and constipation

OCCUPATION . . . Among sedentary workers, chronic constipation and impaired digestion are often the result of lack of exercise and improper eating habits which retard normal peristaltic action in the gastrointestinal tract.

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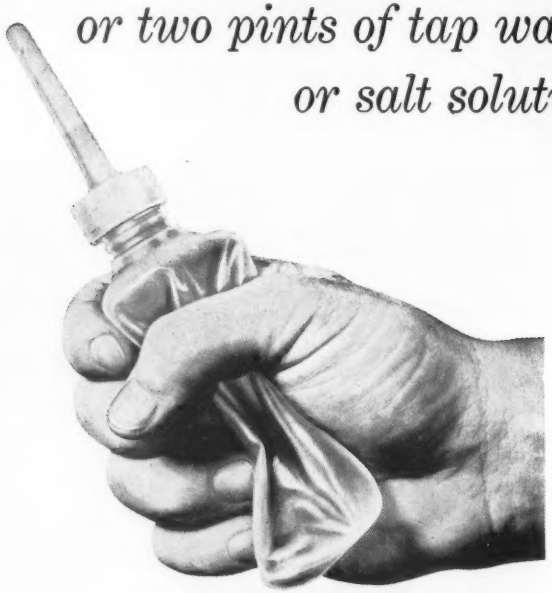
more effective than one
or two pints of tap water
or salt solution



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1. Pollack, B.: Geriatrics *11*:253 (June) 1956.

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CONSTIPATED ELDERLY

- Softens stools naturally without side-effects
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2 FORMS—Liquid and Powder
Dose: 2 Tbs. A.M. and P.M.

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MALT SOUP
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*Non-diastatic barley malt extract neutralized with potassium carbonate

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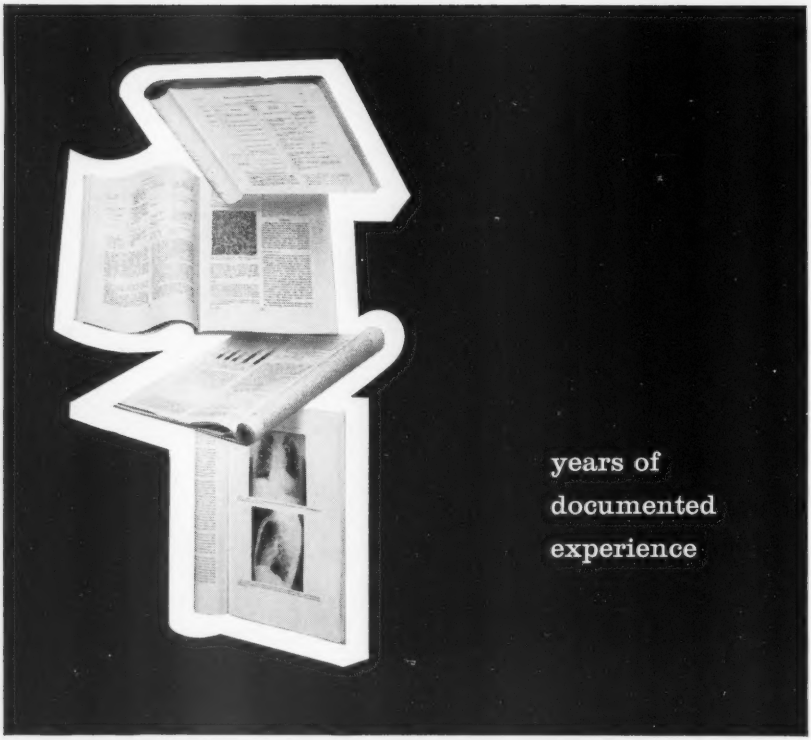

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Volume 12, Number 1 Geriatrics

Intrathoracic emergencies in the aged

DUANE CARR, M.D.
MEMPHIS, TENNESSEE

"But when old age upon them
Crept with its aches and qualms,
King Solomon wrote the proverbs,
King David wrote the psalms."
Author unknown

An acute emergency state may develop in an elderly patient as the result of total esophageal obstruction or spontaneous pneumothorax. Correctible lesions producing obstruction are cardiospasm, hiatal hernia, and esophageal diverticulum, which cause a bolus of food to lodge in the esophagus.

Spontaneous pneumothorax is poorly tolerated in an emphysematous patient and may cause death unless promptly corrected. Its clinical resemblance to an acute coronary thrombosis is pointed out.

◆ We are apt to think of the infirmities and disabilities of old age as creeping gradually upon their victims as the result of degenerative processes. And the patients themselves are likely to regard their ailments and symptoms as the natural result of growing old. However, there occur some acute, life-threatening episodes which can be easily rectified if their true nature is recognized. We shall concern ourselves here with acute total obstruction of the esophagus which may be caused by attempting to swallow a bolus too large to pass a partial obstruction by a carcinoma, benign tumor, or cardiospasm. Esophageal diverticuli and diaphragmatic hiatal hernias can cause similar acute episodes. We shall consider the acute emergencies created by spontaneous pneumothorax in an elderly emphysematous person, and shall review the similarity between the clinical picture of an acute coronary thrombosis and that presented by some other clinical catastrophes.

Acute Esophageal Obstruction

Physicians are frequently told by relatives of an elderly patient that "Mother (or Father) was perfectly all right until night before last, but since then she has vomited everything taken by mouth, even water." Careful questioning of the patient will often reveal an absence of nausea, but a feeling of fullness or pressure in the epigastrium and behind the sternum is noted, interpreted by the patient as "gas." There may be eructation of mucus and saliva in addition to whatever food or fluid was ingested recently.

Such a history suggests a food impaction in the esophagus which is already partially obstructed from other causes. Further inquiry into preceding events usually reveals that the patient was eating some type of meat and that he wears dentures (or refuses to wear them). When a person loses the sense of touch in the palate because of dentures, he is not always aware of the size of the bolus he attempts to swallow. And, of course, when he does not use his dentures, he cannot chew meat properly.

First consideration in such a case is removal of the obstruction, for an elderly patient becomes dehydrated, weak, and his already precarious electrolyte balance is quickly deranged. Identification of the primary lesion can wait until the immediate obstruction is relieved and a semblance of physiologic balance restored. Since meat is the most common offender, it is best to attempt to relieve the obstruction with a digestant such as Caroid before resorting to esophagoscopy, which can be a tedious and trying procedure, not without its hazards in the elderly person.

The patient is encouraged to empty his esophagus as completely as possible —a feat which may be easier if he is in a prone, Trendelenburg position. Then he is given a half ounce of Caroid powder mixed with about an ounce of water, and this is repeated in thirty minutes. An hour later he is given a few ounces of preferably sterile water to drink. If that passes satisfactorily, fluids are increased in amount, adding strained soups, pureed vegetables, and ground meat as tolerated. Esophagoscopic examination with mechanical removal of the offending substance should be undertaken only if such a regimen fails to clear the obstruction within a few hours. This would indicate that a piece of bone or cartilage may have been ingested.

Esophagoscopy may be necessary later as a diagnostic measure for identification of the original partial obstruction, but this can be performed better when the esophagus has been cleaned out. Barium studies of the esophagus are also carried out more easily after the total obstruction has been relieved. Visualization of the esophagus is better, and there is less danger of the barium spilling over into the tracheobronchial tree.

Esophageal Diverticulum

The typical history of an esophageal diverticulum is a long one of intermittent difficulty in swallowing. This is particularly true if it is of the Zenker's type, which arises at the junction of the hypopharynx and esophagus, and which may enlarge until it hangs down into the superior mediastinum. Usually the patient's appetite is fair, but a few mouthfuls of food fill the diverticulum and press upon the rest of the esophagus, making it difficult to swallow additional food. Regurgitation, when it occurs, is usually of food which has not been even partially digested. There is often an associated cough, and chest roentgenograms show a chronic fibroid pneumonitis secondary to recurring spill-over of food and fluids into the tracheobronchial tree. Acute total obstruction of the esophagus may also occur, as illustrated by the following case.

Case 1. E. S., an 81-year-old white woman, in an obvious state of malnutrition and dehydration, was admitted to the Baptist Memorial Hospital in Memphis on September 10, 1954. Her history revealed difficulty in eating, complicated for several years by some mental aberrations in regard to food. According to the attendants at her nursing home, she had been unable to retain even water for the preceding seventy-two hours, and attempts to swallow fluids were accompanied by coughing and strangling.

A swallow of barium revealed a Zenker's diverticulum without evidence of carcinoma or other obstruction. Her condition was considered too poor for esophagoscopic examination.

Her electrolyte and fluid balance were restored by intravenous therapy, but her serum proteins remained at a low level and she tolerated intravenous amino acids poorly. On September 17, gastrostomy was performed under local anesthesia. Administration of a homogenized regular

diet through the gastrostomy tube resulted in a great improvement in the patient's condition.

On October 10, under local infiltration anesthesia, the Zenker's diverticulum was freed of its attachments, inverted in the neck, and sutured to the border of the sternocleidomastoid muscle.

Thereafter the patient was able to eat freely and well. She left the hospital three weeks later, after gaining 22 pounds, and overcoming her fear of eating. Two months later, when she had gained 30 pounds, she was temporarily hospitalized for closure of the gastrostomy wound.

Comment: For many years this patient had suffered from the typical symptoms of a Zenker's diverticulum of the esophagus. When the diverticulum became so distended that nothing could pass through the continuing esophagus, she became dehydrated, out of electrolyte balance, and desperately ill. Gastrostomy under local anesthesia was necessary to restore the patient's physiologic balance, for use of a Levine tube was impossible for this purpose, and amino acids caused unfavorable reactions. The first stage of an old-fashioned Lahey repair of the diverticulum, performed under local anesthesia, restored the patient's ability to eat normally. As a result, she gained 30 pounds and appears in excellent health. Because of age and cerebral arteriosclerosis, the second stage of the procedure, excising the sac, was not carried out, and, in all probability, it never will be.

Diaphragmatic Hiatal Hernia

Diaphragmatic hiatal hernia, which is far more common than many physicians realize, accounts for many cases of chronic, intermittent, and recurring "indigestion." Occasionally, a patient may be able to identify the onset of symptoms with some physical exertion, such as lifting a heavy object; more frequently, the onset is insidious. The characteristic complaints are a sensation of fullness in the epigastrium, pressure behind the lower sternum after eating, indigestion with regurgitation of undigested food particles, and, in some instances, "heartburn," reflux of the acid contents of the herniated portion of the stomach into the esophagus.

Complete obstruction may occur abruptly when enough of the stomach is forced through the hiatal orifice to occlude the gastric lumen. The patient usually has severe epigastric and retrosternal pain, frequently radiating to the left shoulder, with nausea and vomiting of all food and fluids which he attempts to swallow. Occasionally the acute obstruction is caused by ingestion of a bolus of meat which will yield to the application of digestants, as I have related previously.

The diagnosis is readily confirmed by barium studies. A Levine tube is passed and, after the accumulated food and fluids are washed out, barium is injected through it. The application of this technic and the need for emergency reduction of the hernia are illustrated in the following case.

Case 2. J. W., a 74-year-old, retired school teacher was admitted to the Baptist Memorial Hospital on October 18, 1948. She was comatose, dehydrated, and emaciated. According to her relatives, she had had a diaphragmatic hernia for twenty years, but refused to have it repaired, even though urged to do so by prominent surgeons in her family. She had always "eaten like a bird," because anything resembling a full meal would produce a sense of pressure in the epigastrium and lower mediastinum, or cause vomiting. Five days before she was hospitalized in Memphis, she had total obstruction, became febrile, and, despite intravenous replacement therapy at the local hospital, lapsed into unconsciousness from which she could not be aroused.

A Levine tube was passed and, after washing out a large quantity of accumulated fluid, detritis, and saliva, barium was introduced. The roentgenogram showed a large diaphragmatic hernia through which almost two-thirds of the stomach was prolapsed into the mediastinum. No intestinal loops were seen above the diaphragm.

Next day the patient's condition was sufficiently improved by blood transfusions, intravenous electrolytes, and Levine tube feedings, so that she could be explored with relative safety. An approach was made through the left ninth intercostal interspace, the hernia was re-

duced, and the diaphragm was closed about the somewhat shortened esophagus. The edges of the new hiatal orifice were securely sutured to the esophagus.

Convalescence was surprisingly smooth. The patient gained weight rapidly after she overcame her fear of eating and, four years later, a routine examination revealed her to be overweight. She was traveling and discovering interesting places to eat all over the country.

Comment: This patient had led a somewhat restricted life for many years, never enjoying really good health, and fully aware that she had a diaphragmatic hiatal hernia. Because of fear of surgery, she refused to have it repaired until total obstruction occurred, and her condition degenerated to one of total electrolyte imbalance and coma. After repair of the defect, she was delighted to find she could eat normally. She gained weight to the point of being placed on a restricted diet. Now, at 82, she has enjoyed over seven years of normal living.

Spontaneous Pneumothorax

Spontaneous pneumothorax is fairly well tolerated by younger persons with a large respiratory reserve. Their history is brief and consists only of pain in the chest with ensuing dyspnea, which is not serious unless a tension pneumothorax develops. But, in the elderly person with pulmonary emphysema and little or no respiratory reserve, even a small spontaneous pneumothorax may become an alarming emergency. It is difficult to diagnose this condition without use of roentgenograms. Breath sounds are so distant and faint that they can hardly be detected with a stethoscope. Yet the life of the patient can be saved if the diagnosis is suspected, the pneumothorax identified, and prompt measures taken to reexpand the partially collapsed lung. This is illustrated in the following case.

Case 3. W. E. M., a 56-year-old white man, was first admitted to the Baptist Memorial Hospital on July 4, 1951, with a history of pain in the right chest and severe dyspnea which had begun four days earlier. For several years, he had been short of breath on exertion, a condition that gradually increased in severity. At the time of admission, he could scarcely breathe.

Examination, roentgenograms, and cardiac studies revealed an elderly, cyanotic man with advanced pulmonary emphysema, bulla formation, and evidence strongly suggestive of cor pulmonale. The dyspnea was partially relieved by aspiration of air from the right pleural space, but the pneumothorax recurred immediately and repeatedly. On July 14, an intercostal tube was placed in the right chest and connected with a water trap.* The lung expanded completely, but collapsed three days later when the tube was withdrawn.

On July 27, the patient's chest was opened, and the persistent leak in the lung identified and sutured. Several large bullous blebs were resected from the lung and the chest was drained with two intercostal tubes with active suction. The lung then expanded and remained in that condition. The patient was discharged eight days later, with approximately his original limited function restored. This later improved upon a bronchial drainage routine and cessation of smoking.

Two years later, the patient had two episodes of spontaneous pneumothorax in the contralateral hemithorax, making it necessary to excise blebs on this side also. The right lung was safely adherent to the chest wall as a result of the first operation and its function was adequate to permit the left thoracotomy. The patient is still living, but with activity restricted because of dyspnea from emphysema.

Comment: One of the reasons this patient's lung did not collapse completely was because of loss of elasticity as a result of pulmonary emphysema. However, a rather small pneumothorax produced a picture of impending death. With re-expansion of the lung, he was returned almost to his former state. After resection of some of the major blebs, his condition was actually improved, with increased activity tolerance and ease in breathing.

Simulated Coronary Occlusion

An acute coronary thrombosis is the first condition suspected when a patient, in or past middle life, has indigestion with

*Current practice would be to insert the intercostal tube at once upon admission to the hospital.

pain in the left chest or behind the sternum. This is especially true if the pain radiates to the left shoulder and arm and is accompanied by a shocklike state with rapid pulse and falling blood pressure. However, diaphragmatic hiatal hernia often causes an identical syndrome, usually after eating. It is difficult for the patient to describe his pain with sufficient accuracy to help determine whether it is pain referred to the shoulder from the diaphragm or the true arm pain referred from myocardial ischemia. An electrocardiogram must be made at once to provide a base line for comparison with electrocardiograms made seventy-two hours later. Many of these elderly patients have electrocardiographic changes which are caused by older, and perhaps healed, myocardial infarcts and these may confuse the diagnosis unless a tracing is made before the changes of an acute thrombosis can be reflected in the electrocardiographic pattern. In a number of cases, patients with episodes caused by diaphragmatic hiatal hernia have been put to bed with a diagnosis of acute coronary thrombosis and kept there *in spite of normal or unchanging electrocardiographic tracings.*

A situation of this type is illustrated in the following case, in which the patient's home physician, an able general practitioner, had suspected and proved the presence of a diaphragmatic hernia when electrocardiographic tracings failed to reveal evidence of coronary thrombosis.

Case 4. E. B. S., a 75-year-old white woman, was seen on May 27, 1955, complaining of nausea and vomiting since ingestion of chicken six days previously. She had pain in the epigastrium and behind the lower sternum. Three days before, she had been placed on the Caroid and water regimen, resulting in relief of her symptoms. Barium studies were carried out, confirming the presence of a large diaphragmatic hiatal hernia.

Especially interesting is the fact that her past history showed intermittent symptoms of "gallbladder trouble" for twenty years, although repeated roentgenograms and function studies were always normal.

Two years before, she had had an acute episode of indigestion after a meal, with retrosternal pain radiating to the left shoulder. This caused her physician to suspect acute coronary thrombosis, especially since she was known to have pronounced hypertension, but electrocardiographic studies were normal then and later. The investigation was carried further, revealing a small diaphragmatic hernia.

The patient has refused surgical repair, although the hernia is growing larger and episodes of obstruction are becoming more frequent.

Comment: This episode, caused by hiatal hernia, simulated acute coronary thrombosis, but showed no myocardial damage in the electrocardiographic tracings. With the second severe acute obstruction in 1955, relief was obtained from the use of Caroid and water. Subsequent barium studies showed that the hernia had enlarged greatly in the intervening two years. Since these hernias are progressive, they must be repaired as early as possible, before total obstruction with its consequent physiologic disturbance.

It is also important to note the similarity between symptoms of acute coronary thrombosis and those of a spontaneous left pneumothorax in an elderly person with pulmonary emphysema. Again, diaphragmatic pain may be referred to the shoulder and upper arm, the patient may become cyanotic and extremely dyspneic, and a shocklike state may develop. In case 3, presence of a pneumothorax could not be detected by physical examination. If the patient had not been hospitalized immediately and a good chest film obtained, he might have died from respiratory, not cardiac, insufficiency. We cannot overemphasize the importance of keeping in mind these entities, which superficially resemble acute heart attacks, but which actually stem from other, and remediable causes.

Conclusions

Acute esophageal occlusion is often caused by ingestion of a bolus of meat

fibers, particularly in the elderly person who either wears dentures or tries to "gum" his meat without them. This state can often be relieved by the simple use of digestants, such as Caroid powder. However, there is usually some underlying cause for the failure of the bolus to pass, such as carcinoma of the esophagus, benign tumors of the esophagus, cardiospasm, or diverticulum of the esophagus. These should always be investigated after the acute episode has been relieved.

Esophageal diverticulum can cause acute total obstruction of the esophagus even though there is a long history of difficulty in swallowing. It is best to repair a known esophageal diverticulum early, while the patient is in good general condition. This will prevent spillover into the lungs and consequent chronic pneumonitis, and avoid the necessity of an emergency repair on a patient in poor condition.

Diaphragmatic hiatal hernia causes recurring symptoms and may reach a point of acute total obstruction of the gastrointestinal tract. Surgical repair is performed better before the emergency arises.

Spontaneous pneumothorax is usually tolerated fairly well by younger people with adequate respiratory reserve, but may present a severe emergency when it occurs in the elderly individual with advanced pulmonary emphysema. It is difficult to detect on physical examination because the breath sounds are already very distant bilaterally. Recognition by roentgenogram is important so that the lung may be re-expanded promptly by aspiration, or by tube drainage under a water seal.

The clinical picture of acute coronary thrombosis can be closely approximated by either a spontaneous pneumothorax or a diaphragmatic hiatal hernia. These entities should be kept in mind and ruled out in the case of an elderly patient with a "heart attack." Both hernia and spontaneous pneumothorax can be corrected with appropriate procedures, but death may ensue if only a cardiac regimen is followed.

PARTIAL ENTEROCELE is potentially dangerous and most frequent in old age. Mortality is high because strangulation may take place rapidly without blockade, symptoms are misinterpreted, and surgery is gravely delayed. Richter's lesion usually involves the ileum and the femoral canal but may appear in any abdominal site of hernia.

Some partial enteroceles produce obstruction with obvious symptoms; but this type is generally repaired promptly, with good results. In other cases, obstruction is relieved by perforation of the entrapped tissue and formation of an enterocutaneous fistula. Operation may consist of herniorrhaphy alone, plication, or inversion of a small strangulated patch, or segmental resection and end-to-end anastomosis. Mikulicz resection or enterostomy through the necrotic region is less taxing.

R. W. GILLESPIE, W. W. GLAS, G. H. MERTZ, AND M. M. MUSSELMAN: Richter's hernia. Its etiology, recognition, and management. Arch. Surg. 73: 590-594, 1956.

Influence of dietary factors upon human serum lipoprotein concentrations

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In this study, pronounced elevations of $S_f°0$-12 and $S_f°12$-20 lipoproteins were associated with diets high in animal fat. Substitution of an unhydrogenated vegetable fat did not produce such elevations, but levels equivalent to the lower levels maintained by diets very low in any fat. Some appreciable elevations in $S_f°20$-100 and $S_f°100$-400 lipoproteins occurred on diets high in carbohydrate.

◆ The significant position of lipoproteins in the series of variables which are generally considered pertinent to the study of atherosclerosis has prompted an evaluation of the effect of dietary composition on human serum lipoprotein concentrations. The specific groups of lipoproteins significantly related to clinical atherosclerosis are the standard $S_f°0$-12, $S_f°12$-20, $S_f°20$-100, and $S_f°100$-400 classes. We have presented evidence that arteriosclerosis accumulates in the blood stream with increasing duration of elevated levels of these groups of lipoproteins.[1] In this study, special attention is given to such variables as total dietary fat intake, source of dietary fat, carbohydrate intake, and caloric intake in evaluating dietary control of the serum levels of these particular lipoproteins.

In the evaluation of total fat intake, source of fat, and carbohydrate intake, these guiding principles were used:

- All dietary periods were approximately isocaloric. Thus, after initial stabilization, weight change was not a variable in the study.
- Calories derived from protein were kept approximately constant throughout the study.
- Only the calories derived from fat and carbohydrate were varied within the isocaloric periods.
- Sources of fat—animal or vegetable—were quantitatively recorded for each period.

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The role of a combined regimen of weight decrease, together with fat restriction, was assessed in a separate study of obese women; its pronounced influence on serum lipoproteins is discussed in this report. Observations during the dietary evaluation led to an investigation of the effect on serum lipoproteins of a daily supplement of eggs to the routine diet of presumably normal individuals.

Methods

In the major dietary evaluation, five men, ranging in age from 20 to 49 years of age, ate their noon and evening meals at a diet table at the Cowell Memorial Hospital, University of California. Breakfast, eaten at home, usually consisted of fruit juice, toast or cereal, and skim milk or coffee. The average breakfast included 271 calories, 13 gm. protein, 2 gm. fat, and 54 gm. carbohydrates, with a negligible amount of cholesterol.

TABLE 1

PROFILE OF THE DIETARY STUDY PERIODS

Period	Duration (weeks)	Average total calories per day	Average grams per day		
			Protein	Fat	Carbohydrates
I	2	2018	94	18	370
II	11	2088	78	100	219
III	10.5	2075	84	103	203
IV	5	2215	99	19	412
V	6	(Interruption of diet table due to influenza epidemic)			
VI	17	2034	97	18	371

Period	Percentage composition of total caloric intake			Origin of fat		
	Protein	Fat	Carbohydrate	Animal	Vegetable	Total fat
I	19	8	73	31	69	18 gm.
II	15	43	42	15	85	100 gm.
III	16	45	39	93	7	103 gm.
IV	18	8	74	60	40	19 gm.
V	6 week (Interruption)					
VI	19	8	73	56	44	18 gm.

TABLE 2

COMPOSITION OF THE DIETARY

Period	Meat	Dairy	Egg	Vegetable	Total protein
	*Distribution of Protein Sources** *Percentage Composition Total Protein Intake:*				
I	15	25	8	52	94 gm.
II	26	26	4	44	78 gm.
III	37	24	26	13	84 gm.
IV	18	32	2	48	99 gm.
V	(Interruption)				
VI	17	30		53	97 gm.
	Distribution of Fat Sources *Percentage Composition Total Fat Intake:*				
I	26	5		69	18 gm.
II	14	1		85*	100 gm.
III	31	24	38	7	103 gm.
IV	50	10		40	19 gm.
V	(Interruption)				
VI	50	6		44	18 gm.

Period	Daily cholesterol intake	Daily egg-yolk intake
I	Less than 0.5 gm.	None
II	Less than 0.5 gm.	None
III	Average of 2.2 gm.	Approximately 7 per day
IV and VI	Less than 0.5 gm.	None

*The bulk of the vegetable fat utilized was a nonhydrogenated cottonseed oil.

All food prepared for each subject at the diet table was to be eaten, with notation made of any amount that might be left.

Blood samples, of 30 cc., were ordinarily drawn at weekly intervals and the serum was analyzed for the concentration of the low density lipoprotein classes—$S_f°0$-12, $S_f°12$-20, $S_f°20$-100, and $S_f°100$-400,* by ultracentrifugal technics described elsewhere.[2]

In profile, the consecutive periods were of the duration and dietary composition presented in tables 1 and 2.

Investigation of the influence of weight reduction, achieved on a diet restricted in total fat and carbohydrate, was carried out in cooperation with the Herrick Memorial Hospital, Department of Research, Berkeley. This study sought to evaluate the nature of the response of obese persons to a group situation organized to motivate weight reduction. A standard reduction diet schedule, as shown in table 3, was prepared and made

*In order to determine lipoprotein concentration values as accurately as possible, they were corrected for interaction effects during the centrifugation process. To show that such a correction has been applied to S_f values, we defined the term standard S_f, or, as represented symbolically, $S_f°$.

TABLE 3

COMPOSITION OF 1,000-CALORIE REDUCTION DIET (HERRICK HOSPITAL)

	Calories	*Protein*	*Fat*	*Carbohydrate*
Breakfast	307	13 gm.	6 gm.	54 gm.
Lunch	319	30 gm.	10 gm.	29 gm.
Dinner	343	31 gm.	11 gm.	33 gm.
Totals	969	74 gm.	27 gm.	116 gm.

available for use at home. The diet schedule emphasized a substitution for foods high in fat and cholesterol. Twenty-eight subjects lost 10 or more pounds in a two-month evaluation period. These subjects had lipoprotein determinations just before and again at the end of the two-month period.

The egg-supplement experiment was performed with the cooperation of 7 members of the Donner Laboratory staff, none of whom was connected with the Cowell Hospital study. Following a three-week control period, 5 of the subjects added to their routine diet an egg preparation, containing 3 egg yolks per serving (table 4). Two servings were consumed during each day for a five- to six-week period, and subjects were followed for an additional two to three weeks. Two of the 7 subjects served as controls for a ten-week period. Blood samples were drawn weekly and the serum analyzed for lipoprotein concentrations.

Results

In evaluation of total dietary fat, source of dietary fat, and carbohydrate intake, periods I, IV, and VI were combined, for they represented similar dietary composition and showed no statistically significant differences. The mean concentrations of the four classes of lipoproteins and the standard error of the means are presented in table 5. The differences in lipoprotein levels between various dietary periods and the significance tests based upon such differences are presented in table 6.

No separation of so-called transition periods from one diet to the next was made. Any transition effects are included in the dietary period of which they represent a part. By having dietary periods of sufficient duration, transition effects are minimized and, if anything,

TABLE 4

COMPOSITION OF EGG-YOLK DIETARY SUPPLEMENT*

(Average intake per day)

Egg yolks	*Protein*	*Fat*	*Carbohydrate*	*Calories*
6	26 gm.	34 gm.	22 gm.	498

*The egg supplement was provided in three different preparations; custard, skim-milk ice cream, and egg sandwiches. Each subject was allowed to choose the egg preparation for any particular day.

TABLE 5

MEAN LIPOPROTEIN LEVELS IN VARIOUS DIETARY STUDY PERIODS

(Expressed in mg./100 cc.)

Period	*Number Determinations**	$S_f°$ *0-12*	$S_f°$ *12-20*	$S_f°$ *20-100*	$S_f°$ *100-400*
Subject W.E.					
I, IV, VI	27	335±4†	56±3	169±3	308±21
II	10	290±11	47±4	142±8	135±16
III	7	394±20	54±4	126±4	125±13
Subject E.S.					
I, IV, VI	30	333±6	62±2	150±3	160±11
II	11	316±21	70±5	127±11	109±12
III	8	463±10	100±3	141±10	100±7
Subject H.S.					
I, IV, VI	27	295±9	63±3	132±5	102±8
II	11	284±13	62±5	97±8	60±7
III	9	466±28	105±7	129±11	72±8
Subject L.H.					
I, IV, VI	19	260±25	30±7	56±18	33±16
II	4	269±17	23±4	30±9	18±7
III	8	341±26	32±3	40±5	17±3
Subject J.M.					
I, IV, VI	18	273±8	44±2	142±5	73±8
II	5	299±25	53±3	147±21	61±13
III	6	365±18	65±4	137±16	56±13

*Generally the interval between blood samples was one week.

†All standard errors are calculated as follows:

$$SE = \frac{S.D.}{\sqrt{n-1}}$$

, where S.E. = standard error of mean, S.D. = standard deviation of mean, and n = number of determinations.

TABLE 6

DIFFERENCES IN LIPOPROTEIN LEVELS IN VARIOUS DIETARY PERIODS

Subject	*Mean lipoprotein levels for dietary period II minus mean for dietary periods I, IV, VI*		*Mean lipoprotein levels for dietary period III minus mean for periods I, IV, VI*		*Mean lipoprotein levels for dietary period III minus mean for period II*	
	△*Lipoprotein level*	*Significance test*	△*Lipoprotein level*	*Significance test*	△*Lipoprotein level*	*Significance test*
S_f°0-12 lipoprotein						
W.E.	—45	$p<0.01$	+ 59	$p<0.01$	+104	$p<0.01$
E.S.	—17	NS	+130	$p<0.01$	+147	$p<0.01$
H.S.	—12	NS	+171	$p<0.01$	+183	$p<0.01$
L.H.	+ 9	NS	+ 81	$0.02<p<0.05$	+ 73	$0.02<p<0.05$
J.M.	+26	NS	+ 92	$p<0.01$	+ 66	$0.05<p<0.1$
S_f°12-20 lipoprotein						
W.E.	— 9	$0.05<p<0.1$	— 2	NS	+ 7	NS
E.S.	+ 7	NS	+ 38	$p<0.01$	+ 30	$p<0.01$
H.S.	— 1	NS	+ 42	$p<0.01$	+ 43	$p<0.01$
L.H.	— 7	NS	+ 2	NS	+ 8	NS
J.M.	+10	$0.01<p<0.02$	+ 22	$p<0.01$	+ 12	$0.02<p<0.05$
S_f°20-100 lipoprotein						
W.E.	—27	$p<0.01$	— 43	$p<0.01$	— 16	$0.05<p<0.10$
E.S.	—24	$0.02<p<0.05$	— 9	NS	+ 15	NS
H.S.	—35	$p<0.01$	— 3	NS	+ 33	$0.02<p<0.05$
L.H.	—26	NS	— 16	NS	+ 10	NS
J.M.	+ 5	NS	— 5	NS	— 10	NS
S_f°100-400 lipoprotein						
W.E.	—173	$p<0.01$	—183	$p<0.01$	— 10	NS
E.S.	—52	$p<0.01$	— 60	$p<0.01$	— 9	NS
H.S.	—42	$p<0.01$	— 30	$0.01<p<0.02$	+ 10	NS
L.H.	—15	NS	— 16	NS	0	NS
J.M.	—13	NS	— 17	NS	— 5	NS

Probability values of 0.1 or less are given; probability values greater than 0.1 are designated as NS (not significant).

the observed differences are conservatively stated.

Findings of the study of 28 women who lost 10 pounds or more on the prescribed 1,000-calorie reduction diet are presented in table 7.

Results of the egg-supplement study are given in table 8. In the presentation of these data, the control period represents the combined observations of the period before and after the egg-yolk supplement period.

The dietary periods of the Cowell Hospital experiment may be characterized by the following summary designations:

Periods I, IV, VI—Low total fat, low cholesterol, high carbohydrate.

Period II—High vegetable fat, low cholesterol, and moderate carbohydrate, some animal fat present.

Period III—High animal fat, high cholesterol and moderate carbohydrate, some vegetable fat present.

The nature of these dietary regimes makes it possible to assess the effects of (1) variation in the origin of fat consumed—that is, animal or vegetable origin—and (2) substitution of carbohydrate for fat in an isocaloric diet schedule on serum lipoprotein concentrations.

From the data in tables 5 and 6, contrasting the low-fat, low-cholesterol, and high-carbohydrate intake with the high-vegetable-fat, low-cholesterol, and moderate-carbohydrate intake, the following observations are noted:

Lipoproteins S_f°0-12. There is no consistent direction of difference in the S_f°0-12 lipoprotein

TABLE 7

CHANGES IN LIPOPROTEIN CONCENTRATIONS ON 1000-CALORIE WEIGHT-REDUCTION PROGRAM

	$S_f°0\text{-}12$ mg./100 cc.	$S_f°12\text{-}20$ mg./100 cc.	$S_f°20\text{-}100$ mg./100 cc.	$S_f°100\text{-}400$ mg./100 cc.	
Initial mean lipoprotein levels	372	93	94	64	Mean wt. = 212 lbs.
Mean lipoprotein levels after two months on diet	326	61	72	27	Mean wt. = 198 lbs.
△ lipoprotein levels	46	32	22	37	△ wt. = 14 lbs.
Significance test for lipoprotein changes	$0.05 < p < 0.1$	$p < 0.01$	$p < 0.01$	$p < 0.01$	

group. There was a trend toward increased values of $S_f°0\text{-}12$ lipoproteins in most of the subjects during the latter half of the high-vegetable fat period. However, the $S_f°0\text{-}12$ concentration values in this half were not significantly different from those in the first half of the same period.

Lipoproteins $S_f°12\text{-}20$. There is no consistent direction of difference in the $S_f°12\text{-}20$ lipoprotein group in the 5 subjects.

Lipoproteins $S_f°20\text{-}100$. There is a lower level of $S_f°20\text{-}100$ lipoproteins in 4 of the 5 subjects in the high-vegetable fat, moderate-carbohydrate period. The magnitude of the difference for the subjects covers a range from 16 to 47 per cent of the mean $S_f°20\text{-}100$ level that was present in the low-fat, high-carbohydrate period. The average difference for these 4 subjects is approximately 27 per cent.

Lipoproteins $S_f°100\text{-}400$. There is a pronounced lower level of $S_f°100\text{-}400$ lipoproteins in all 5 subjects in the high-vegetable fat, moderate-carbohydrate period. The magnitude of the difference covers a range from 17 to 56 per cent of the mean $S_f°100\text{-}400$ level that was present in the low-fat, high-carbohydrate period. The average difference for all subjects is approximately 38 per cent.

Contrasting the low-fat, low-cholesterol, and high-carbohydrate period with the high-animal fat, high-cholesterol, and moderate-carbohydrate period, the following observations can be made:

Lipoproteins $S_f°0\text{-}12$. There is a noticeable elevated level of $S_f°0\text{-}12$ lipoproteins in all 5 subjects in the high-animal-fat, moderate-carbohydrate period. The magnitude of the difference covers a range from 17 to 58 per cent of the mean $S_f°0\text{-}12$ level in the low-fat, high-carbohydrate period. The average difference for all subjects is approximately 36 per cent.

Lipoproteins $S_f°12\text{-}20$. There is a higher level of $S_f°12\text{-}20$ lipoproteins in 4 of the 5 subjects in the high-animal-fat, moderate-carbohydrate period. The magnitude of the difference covers a range from 6 to 67 per cent of the mean $S_f°12\text{-}20$ level in the low-fat, high-carbohydrate period. The average difference for these 4 subjects is approximately 46 per cent.

Lipoproteins $S_f°20\text{-}100$. There is a lower level of $S_f°20\text{-}100$ lipoproteins in all 5 of the subjects in the high-animal-fat, moderate-carbohydrate period. The magnitude of the difference covers a range from 2 to 29 per cent of the mean $S_f°20\text{-}100$ level in the low-fat, high-carbohydrate period. The average difference for all subjects is approximately 13 per cent.

Lipoproteins $S_f°100\text{-}400$. There is a definitely lower level of $S_f°100\text{-}400$ lipoproteins in all 5 of the subjects in the high-animal-fat, moderate-carbohydrate period. The magnitude of the difference covers a range from 23 to 60 per cent of the mean $S_f°100\text{-}400$ level in the low-fat, high-carbohydrate period. The average difference for all subjects is approximately 40 per cent.

When the high-vegetable fat, moderate-carbohydrate period is contrasted with the high-animal-fat, moderate-carbohydrate period, these observations can be made:

Lipoproteins $S_f°0\text{-}12$. There is a distinctive higher level of $S_f°0\text{-}12$ lipoproteins in all 5 of the subjects in the high-animal-fat period. The magnitude of the difference covers a range from 22 to 64 per cent of the mean $S_f°0\text{-}12$ level in the high-animal-fat period. The average difference for all subjects is approximately 39 per cent.

Lipoproteins $S_f°12\text{-}20$. There is a higher level of $S_f°12\text{-}20$ lipoproteins in all 5 subjects in the high-animal-fat period. The magnitude of the difference covers a range from 15 to

TABLE 8

EFFECT OF EGG-YOLK SUPPLEMENT ON SERUM LIPOPROTEIN LEVELS

Subject, sex and age	$S_f°0\text{-}12$ *mg./100 cc.*	$S_f°12\text{-}20$ *mg./100 cc.*	$S_f°20\text{-}100$ *mg./100 cc.*	$S_f°100\text{-}400$ *mg./100 cc.*
F.G., male, 26				
Lipoprotein level during egg supplement	277	41	37	4
Control lipoprotein level	243	30	34	7
△ Lipoproteins	34	11	3	—3
Significance test	$0.01<p<0.02$	NS	NS	NS
A.H., female, 36				
Lipoprotein level during egg supplement	449	19	7	1
Control lipoprotein level	430	26	15	1
△ Lipoproteins	19	—7	—8	0
Significance test	NS	NS	NS	NS
D.P., female, 34				
Lipoprotein level during egg supplement	295	19	11	4
Control lipoprotein level	243	19	19	4
△ Lipoproteins	52	0	—8	0
Significance test	$0.02<p<0.05$	NS	NS	NS
D.R., male, 32				
Lipoprotein level during egg supplement	494	52	41	4
Control lipoprotein level	479	49	56	4
△ Lipoproteins	15	3	—15	0
Significance test	NS	NS	NS	NS
A.T., male, 27				
Lipoprotein level during egg supplement	239	30	37	7
Control lipoprotein level	224	26	22	4
△ Lipoproteins	15	4	15	3
Significance test	NS	NS	NS	NS

70 per cent of the mean $S_f°12\text{-}20$ level in the high-vegetable-fat period. Average difference for all subjects is approximately 38 per cent.

Lipoproteins $S_f°20\text{-}100$. There is no consistent direction of difference in the $S_f°20\text{-}100$ lipoproteins in the 5 subjects.

Lipoproteins $S_f°100\text{-}400$. There is a slightly lower measured level of $S_f°100\text{-}400$ lipoproteins in 4 of the 5 subjects in the high-animal-fat period, but the changes cannot be proved significant. The magnitude of the difference covers a range from 2 to 8 per cent of the mean $S_f°100\text{-}400$ level in the high-vegetable-fat period for each subject. The average difference for these 4 subjects is approximately 6 per cent, which, however, indicates little individual or group significance.

Discussion

One of the most striking features of these studies of the relation of dietary factors to serum lipid levels is the dissociation between the effects produced by a particular diet different on segments of the lipoprotein spectrum. From the current data, it may be stated that the standard $S_f°0\text{-}12$ and $S_f°12\text{-}20$ lipoproteins are obviously affected by certain dietary modifications, with essentially no effect on the $S_f°20\text{-}100$ and $S_f°100\text{-}400$ lipoproteins. However, other dietary modifications produce little or no effect on the $S_f°0\text{-}12$ and $S_f°12\text{-}20$ lipoproteins, but do produce definite effects upon the $S_f°20\text{-}100$ and $S_f°100\text{-}400$ lipoproteins. Since cholesterol is a chemical component in all these lipoprotein classes, it is possible that the serum cholesterol may rise, remain constant, or fall with cer-

tain dietary alterations. This, however, depends upon the direction of change and the magnitude of change of the various parts of the low density lipoprotein spectrum. A constant serum cholesterol level could be anticipated even in the face of major alterations in serum lipoprotein transport, if changes in one segment approximately balanced those in another. Under such circumstances, constancy of serum cholesterol would erroneously indicate no dietary effect.

ANIMAL VERSUS VEGETABLE FAT

There is considerable contradiction in the literature as to the relative roles of animal fat and vegetable fat in control of serum lipid levels. Most of such studies employed serum cholesterol levels as a guide in assessing responses. Furthermore, the composition of either the animal fat or the vegetable fat varied from study to study. Hildreth and Keys both found that addition of vegetable fat to a low-fat diet caused a rise in serum cholesterol levels, indicating that fat of either animal or vegetable origin was equivalent in effect upon serum cholesterol levels.[3,4] Kinsell, Groen, Ahrens, and Hardinge concluded that animal fat in the diet was associated with higher serum cholesterol levels than was vegetable fat.[5-8] In the present studies, with diets specified in tables 1 and 2, these conclusions are clearly indicated:

1. There is a pronounced difference with respect to effect upon serum lipid levels between isocaloric diets high in vegetable fat as compared with those high in animal fat.

2. The standard $S_f°0$-12 and $S_f°12$-20 lipoprotein levels, the major cholesterol bearers of serum, are definitely higher when animal fat is used in the diet rather than vegetable fat. The $S_f°20$-100 and $S_f°100$-400 lipoprotein levels are virtually independent of whether the fat ingested is animal or vegetable.

3. The question arose as to whether the cholesterol of animal fat was responsible for the lipoprotein effects observed, since the animal-fat diet was also very high in cholesterol, primarily from egg yolks.[9] From the data gathered in the egg-yolk supplement study, as shown in table 8, it appears that cholesterol, in itself, or any constituent of egg yolk, cannot provoke a large rise in $S_f°0$-12 lipoproteins when that supplement is added to an average American diet, which is moderately high in animal fat. Whether the pronounced rise in $S_f°0$-12 lipoprotein observed in going from the low-fat or high-vegetable-fat diet to the high-animal-fat and high-cholesterol diet was the result of cholesterol, or other constituent of egg yolk, or whether the result of some other agent, as animal fat itself, cannot be answered from the present studies.

4. The present studies lead to the conclusion that a noxious effect of animal-fat sources explains the observed results rather than a protective effect of vegetable-fat sources. This conclusion is based upon the observation that, with isocaloric diets, the $S_f°0$-12 and $S_f°12$-20 lipoprotein levels are not significantly different in either the high-vegetable-fat or the low-total-fat intake period.

5. Observation of lipoprotein alterations and independent studies of chemical composition of serum lipoproteins show that the anticipated differences in serum cholesterol levels between the animal-fat and vegetable-fat dietary periods can be estimated, if there is an assumption of no alteration in high density lipoprotein.[10]

For standard $S_f°0$-20 lipoproteins, approximately 34 per cent of the lipoprotein is cholesterol. For $S_f°20$-400 lipoproteins, approximately 13 per cent of the lipoprotein is cholesterol. Lipoprotein and estimated cholesterol alterations between animal- and vegetable-fat diets in this 5-case series are presented in table 9.

Independent determinations on these 5 subjects during the high-animal-fat period show that the mean serum choles-

TABLE 9

LIPOPROTEIN AND CHOLESTEROL ALTERATIONS IN ANIMAL- AND VEGETABLE-FAT DIETS

Subject	*ΔS_f°0-20 (animal fat period minus vegetable fat period) mg./100 cc.*	*ΔS_f°20-400 (animal fat period minus vegetable fat period) mg./100 cc.*	*Δ Cholesterol from S_f°0-20 mg./100 cc.*	*Δ Cholesterol from S_f°20-400 mg./100 cc.*	*Estimated Δ total serum cholesterol mg./100 cc.*
L.H.	81	10	27	1	28
J.M.	78	—15	22	—2	20
H.S.	226	45	76	6	82
W.E.	111	—26	37	—3	34
E.S.	178	6	60	1	61
Mean	135	4	45	1	46

terol was 297 mg./100 cc. With an estimated 46 mg./100 cc. drop from the lipoprotein alterations, this would represent a 15.5 per cent fall in cholesterol in the shift to high-vegetable-fat from high-animal fat. The order of magnitude of this fall is comparable with the observation by Ahrens of 24 per cent in his 6 subjects on formula diets—an analysis excluding transition periods.[7]

6. It should be emphasized that caloric intake, in itself, played no role in the observed changes between high-vegetable-fat and high-animal-fat diets, since a constant caloric intake was maintained in both periods.

HIGH FAT VERSUS LOW FAT DIETS

The current studies allow several conclusions to be drawn concerning effects of high-fat versus low-fat diets. In maintenance of isocaloric composition of the diet, when shifting from high fat to low fat, two caloric supplementations are possible—replacement of the fat with carbohydrate or with protein. Only the replacement with carbohydrate was investigated in this study, and the following conclusions were drawn:

1. The low-fat diet, maintained isocaloric with carbohydrate supplementation, produces effects upon the serum lipoproteins different from those of the high-vegetable-fat or high-animal-fat diets.

2. The S_f°0-12 and S_f°12-20 lipoproteins showed no consistent differences when the high-vegetable-fat diet was compared with the low-fat, isocaloric diet. The S_f°0-12 and S_f°12-20 lipoproteins were noticeably lower on the low-fat diet than on the diet high in animal fat. Since the S_f°0-12 and S_f°12-20 lipoprotein concentrations were essentially identical on the low-fat and the high-vegetable-fat diets, at isocaloric levels, there is no reason to suspect any effect of vegetable fat in maintenance of low levels of these lipoprotein classes. Rather, evidence suggests that animal fat is associated with their elevation.

3. The S_f°20-100 and S_f°100-400 lipoprotein classes, considered as a group, showed a consistent and significant elevation in the low-fat dietary period in contrast with either the high-vegetable-fat or high-animal-fat period. It is of special interest that, although the S_f°20-100 and S_f°100-400 lipoproteins are high in triglyceride content, with approximately 50 per cent of the lipoprotein being triglyceride, the serum levels of these lipoprotein classes are *elevated* on a diet *low* in triglyceride content.

It is of prime importance to understand what specific dietary factor may account for the observed elevation of S_f°20-100 and S_f°100-400 lipoproteins on the low fat-high carbohydrate diet. Calories should be considered, but it is evident

that calories cannot possibly be responsible for the observed lipoprotein findings, since all three dietary periods were isocaloric. The effect on $S_f°20$-400 lipoproteins was the same for animal and for vegetable fat. The one outstanding difference in the low-fat period was the high carbohydrate content of the diet, this being necessary to keep the diets isolcaloric.

The most reasonable explanation is that carbohydrate, in excess, can cause elevation of the $S_f°20$-400 lipoprotein classes. Good evidence for this explanation, by Hatch, Abell, and Kendall, is already in the literature.[11] Their studies of the rice diet showed that replacement of dietary fat by carbohydrate in the form of rice, at isocaloric levels, resulted in an increase in the serum concentration of neutral fat in many patients, and, where measurements were available, in the S_f20-100 lipoprotein levels. Although their lipoprotein measurements were not corrected to standard flotation conditions, there is a high correlation between the older S_f20-100 measurements and the standard $S_f°20$-400 measurements. Elevation of neutral fat would bespeak a probable elevation in $S_f°20$-400 lipoproteins, for these are ordinarily the major neutral fat bearers of serum. Whether replacement of dietary fat by protein, instead of carbohydrate, in the effort to maintain isocaloricity, would have resulted in analogous $S_f°20$-400 lipoprotein elevations cannot be answered from present studies, for such protein supplementation was not tried.

An alternative explanation of either our present results or those of Hatch and associates is that fat deficiency, rather than carbohydrate supplementation, is responsible for the rise in $S_f°20$-400 lipoprotein levels. We doubt the truth of such an explanation, because of our observations on diets simultaneously restricted in fat and carbohydrate.

4. In the 5 subjects studied, the $S_f°20$-400 was 80 mg./100 cc. higher in the low-fat, high-carbohydrate diet than in the high-vegetable-fat, moderate-carbohydrate period, and was 76 mg./100 cc. higher in the low-fat, high-carbohydrate diet than in the high-animal-fat, moderate-carbohydrate diet. Since the cholesterol represents approximately 13 per cent of the $S_f°20$-400 lipoproteins, the anticipated cholesterol changes would be only 10 mg./100 cc., changes which would be difficult to observe in a comparison of the low-fat period with the high-vegetable or high-animal-fat peiods. Furthermore, in comparing a high-animal-fat moderate-carbohydrate diet with a low-fat, high-carbohydrate diet, the $S_f°0$-12 alterations are shifting the serum cholesterol level in a direction opposite to that produced by the $S_f°20$-400 lipoprotein alterations.

5. The findings reported here are for 5, carefully studied individuals, none of whom was characterized by extremes in lipoprotein distributions. Thus, no cases were included which showed the massive elevation of $S_f°0$-12 as seen in xanthoma tendinosum, nor were there any with the massive elevations of $S_f°20$-100 or $S_f°100$-400, as seen in xanthoma tuberosum or idiopathic hyperlipemia. Whether such cases, demonstrating extremes of lipoprotein transport defects, would respond to the various diets in a manner similar to the cases reported here cannot be discerned from present data. For example, Keys reported one case of xanthoma tuberosum, in which serum cholesterol level fell from 900 to 250 mg./100 cc. on a low-fat diet and returned essentially to the initial level when vegetable fat was added to the diet.[4] Since xanthoma tuberosum is characterized by massive elevations of $S_f°20$-400, it would appear that, in this one case, the $S_f°20$-400 levels must have been raised by vegetable fat. Yet, in the present studies, replacement of carbohydrate by vegetable fat resulted in a lowering of the $S_f°20$-400 levels. Very likely, the results reflect no incon-

sistency, but rather a difference in responsiveness in individuals with differences in lipoprotein transport patterns.

DIETS WITH AND WITHOUT CALORIE RESTRICTION

We have pointed out that, when a shift is made from a high-fat to a low-fat diet isocalorically equivalent by the supplementation with carbohydrate, there is an elevation in the lipoproteins of the $S_f°20$-400 classes. We have indicated that carbohydrate was responsible for this change. Further supporting evidence appears in the weight-reduction study reported in table 7. In that study, fat was restricted to approximately the same extent as in the other low-fat studies reported here. Carbohydrate supplementation was not used, however, because an effort was being made to have the patients lose weight. For those persons who demonstrated probable adherence to the diet by having lost 10 or more pounds in a two-month period, there was a fall in the level of both the $S_f°0$-20 lipoprotein and the $S_f°20$-400 lipoprotein concentrations. For 28 individuals, the mean weight loss was 14 lb.; the mean fall in $S_f°0$-20 lipoproteins was 78 mg./100 cc.; and the mean fall in $S_f°20$-400 lipoproteins was 59 mg./100 cc.

From the above data, the fall in $S_f°0$-20 lipoprotein concentration is to be anticipated for the restriction of animal fat in the diet. The fall in the $S_f°20$-400 lipoprotein concentration is definite and significant and is *opposite* to the results obtained with the low-fat diet supplemented by carbohydrate, in which the $S_f°20$-400 lipoproteins actually increased. Since both the isocaloric diet low in fat and the low caloric diet low in fat are comparable in diminution of fat intake, it is difficult to visualize that fat in itself can be responsible for the opposite behavior of the $S_f°20$-400 lipoproteins.

However, the isocaloric diet is high in carbohydrate, whereas the low-calorie diet is very low in carbohydrate, and results are quite consistent with the concept that dietary carbohydrate increases are on the average accompanied by an elevation in $S_f°20$-400 lipoprotein level. Calories would not seem to be of prime importance in this effect, because, as shown above, the $S_f°20$-400 lipoprotein elevation accompanied carbohydrate replacement of fat *even at* isocaloric levels. The lowering of $S_f°20$-400 lipoprotein concentrations observed in these experiments on caloric restriction is consistent with the lowering of S_f20-100 lipoproteins reported by Walker and associates and with the observed association of lipoproteins of the $S_f°20$-400 classes with relative weight.[12,1]

LONG-TERM VERSUS SHORT-TERM DIETARY EFFECTS

Consideration of the potential application of dietary measures in control of serum lipoprotein levels—for example, in efforts to reduce rate of accumulation of arteriosclerosis—raises the question of whether dietary effects observed over a short period can be generalized with those which might be anticipated over a long period. In the present studies of diets, all at isocaloric levels, the following durations were involved: total period of high-animal-fat intake, ten and one-half weeks; total period of high-vegetable-fat intake, eleven weeks; and total period of low-fat, high-carbohydrate intake, twenty-four weeks.

These are relatively long periods in an experimental sense, although short compared with possible periods in therapeutic or prophylactic studies. Whether the observed findings would be altered if any period were greatly extended cannot be determined from these data. The burden of proof that different results would be obtained over lifetime periods rests with those who might suspect such differences.

Conclusions

1. In a controlled study of 5 persons on isocaloric diets, the standard $S_f°0$-12 and $S_f°12$-20 lipoproteins were greatly elevated on a diet high in animal fat as contrasted either with a diet equally high in vegetable fat or a diet low in fat, supplemented by carbohydrate. With respect to $S_f°0$-12 and $S_f°12$-20 lipoproteins, no significant difference was apparent between the diet low in fat and the diet high in vegetable fat. The difference between animal and vegetable fat appears to be caused by an unfavorable effect of animal fat rather than by a favorable effect of vegetable fat.

2. The standard $S_f°20$-400 group of lipoproteins was essentially similar in level in diets high in vegetable fat and those high in animal fat, but distinctly higher in the low-fat, high-carbohydrate diet. The changes in $S_f°20$-400 lipoproteins appear to have been the result of the rise in carbohydrate intake on the low-fat diet. Calories appear unimportant in this effect, since all diets were isocaloric.

3. A group of subjects in a weight-reduction study ingested a low-fat, low-carbohydrate diet. The $S_f°0$-12 and $S_f°20$-400 levels fell on this regimen, suggesting that the effect on $S_f°20$-400 lipoproteins observed in the isocaloric diets was caused by carbohydrate supplementation, rather than by any fat deficiency.

4. An egg-yolk supplement, equivalent in egg yolk and cholesterol to that of the animal-fat period in the isocaloric experiment, produced minor elevation in the $S_f°0$-12 lipoproteins in a group of persons already on a moderately high animal-fat intake. Whether egg yolk or cholesterol would produce a greater effect on a low-fat diet or a high-vegetable-fat diet remains unanswered from these data.

5. A dissociation exists between the effects of various dietary measures on the $S_f°0$-20 lipoproteins and the $S_f°20$-400 lipoproteins. On certain types of diets, both classes change in the same direction; on others, one class may change in the opposite direction from the other. Since both classes are cholesterol bearers, the dissociation could be obscured if the only analytic measurement available were the serum cholesterol level.

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This work was supported in part by the United States Atomic Energy Commission, National Heart Institute of the U. S. Public Health Service. It was done during the tenure of a research fellowship of the San Joaquin County Heart Association, an affiliate of the American Heart Association. Acknowledgment is expressed to William Donald, M.D., for his interest and support.

REFERENCES

1. GOFMAN, J., O. DE LALLA, F. GLAZIER, N. FREEMAN, F. LINDGREN, A. NICHOLS, B. STRISOWER, and A. TAMPLIN: The serum lipoprotein transport system in health, metabolic disorders, atherosclerosis and coronary heart disease. Plasma 2: 413, 1954.
2. DE LALLA, O., and J. GOFMAN: Ultracentrifugal analysis of human serum lipoproteins. Methods of Biochemical Analysis, edited by D. Glick. New York: Interscience, volume I, 1954.
3. HILDRETH, E., S. MELLINKOFF, G. BLAIR, and D. HILDRETH: The effect of vegetable fat ingestion on human serum cholesterol concentration. Circulation 3: 641, 1951.
4. KEYS, A.: The relation in man between cholesterol levels in the diet and in the blood. Science 112: 79, 1950.
5. KINSELL, L., G. MICHAELS, L. DE WIND, J. PARTRIDGE, and L. BOLING: Serum lipids in normal and abnormal subjects. California Med. 78: 5, 1953.
6. GROEN, J., B. TJIONG, C. KAMMINGA, and A. WILLEBRANDS: Influence of nutrition, individuality, and various forms of stress on serum cholesterol. Voeding 13: 556, 1952.
7. AHRENS, E., D. BLANKENHORN, and T. TSALTAS: Effect on human serum lipids of substituting plant for animal fat in diet. Proc. Soc. Exper. Biol. & Med. 86: 872, 1954.
8. HARDINGE, M., and F. STARE: Nutritional studies of vegetarians. J. Clin. Nutrition 2: 83, 1954.
9. MESSINGER, W., Y. POROSOWSKA, and J. STEELE: Effect of feeding egg yolk and cholesterol on serum cholesterol levels. Arch. Int. Med. 86: 189, 1950.
10. LINDGREN, F., A. NICHOLS, and N. FREEMAN: Physical and chemical composition studies of fasting and heparinized human sera. J. Phys. Chem. 59: 930, 1955.
11. HATCH, F., L. ABELL, and F. KENDALL: Effects of restriction of dietary fat and cholesterol upon serum lipids and lipoproteins in patients with hypertension. Am. J. Med. 19: 48, 1955.
12. WALKER, W., E. LAWRY, D. LOVE, G. MANN, S. LEVING, and F. STARE: Effect of weight reduction and caloric balance on serum lipoprotein and cholesterol levels. Am. J. Med. 14: 654, 1953.

SYMPOSIUM

Physiologic aspects of aging

FOREWORD

◆ Although psychiatrists have long been interested in the aging process with its direct effects upon the individual and its more subtle ramifications into the social, political, cultural, economic, and community life of our times, it is only recently that our enlarged knowledge of psychodynamics and milieu therapies, in addition to pharmacologic advances, has enabled us to plan effective treatment. Today, the psychiatrist no longer regards the aging individual as his responsibility because of the lack of other resources, but rather because of his ability to interpret the prevention and treatment of the special problems of the aging into definitive programs.

It is probable that the psychiatrist, with his medical orientation and special knowledge of psychologic phenomena, is best able to delineate the comprehensive understanding and imaginative thinking which is required to absorb the tremendously increased numbers of the elderly into our expanding and productive economy. The American Psychiatric Association has recently created a standing committee of psychiatrists to explore all avenues leading to better understanding of this multidimensional problem and to make existing knowledge available as a part of its resource function.

The Galesburg Conference, under the cosponsorship of the Galesburg State Research Hospital and the University of Illinois College of Medicine, was organized in an attempt to integrate the available knowledge dealing with the process of aging. In the January issue of *Geriatrics*, the observed metabolic changes were presented by distinguished physiologists. The second portion of this meeting, which was held at Galesburg State Research Hospital on May 5, 1956, dealt with the psychiatric implications of aging, was presented by a group of well known psychiatrists who have particular interest in this area.

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LESTER H. RUDY, M.D.

Brain composition during the whole life span

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The brain exhibits changes in the chemical substances throughout life. A gradual increase of water at the expense of solid constituents is observed in old age. These changes, along with the morphologic alterations, may represent the basis for mental impairment in the elderly.

◆ Although the general impairment of mental and physical ability which occurs in old age is well recognized, there has been limited research on the changes in the chemistry and physiology of the brain which accompany such impairments. Much study is needed before we can answer the questions as to what happens to the brain with aging, and what can be done about these changes.

Before we discuss the available data, it might be well to point out some of the difficulties facing the investigator who wishes to study the shifts which occur in brains of aged individuals. In the first place, animals of known age beyond that of the breeding period are exceedingly difficult to obtain. We have been forced to buy young animals and allow them to grow old in our laboratory, which is a slow and costly procedure. However, even this program is fraught with troubles, because aged animals, like elderly human beings, are subject to many ills. Variations in temperature, humidity, and many unknown factors affect our colony of old animals, and, despite our best efforts, we frequently lose valuable animals before the brains can be studied.

In dealing with the brains of human beings, the investigator is faced with even greater problems. In many laboratory animals, such as the rat, the genetic strains are more homogeneous than are those of man. Such hereditary conformity makes for decreased variability among individuals and means that relatively fewer animals must be studied for valid results. Moreover, in analyzing the comparatively simple brain of rat and rabbit, we do not have the pronounced differences which appear in samples taken from anatomically and functionally distinct areas of the cortex of a human brain (table 1). This inherent variation makes it much more difficult to obtain values which are statistically significant for the human brain than for the animal brain.

Another problem arises from the fact that human brains cannot be secured in as fresh a state as brains from laboratory animals. Our best efforts have succeeded in sampling a human brain no sooner than

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TABLE 1

TOTAL NITROGEN CONTENT OF FOUR DIFFERENT AREAS OF CEREBRAL GRAY MATTER OF PATIENT B, AGE 69, AND OF HEMISPHERES OF FOUR RABBITS

(Grams per cent)

		Patient	*Rabbit hemispheres*
Frontal pole	R	1.56	1.70
	L	1.44	1.74
Other frontal area	R	1.44	1.71
	L	1.33	1.71
Temporal pole	R	1.39	1.70
	L	1.54	1.72
Occipital pole	R	1.64	1.70
	L	1.88	1.75

two hours after death, whereas, with experimental animals, the brain is placed in dry ice and ether, or appropriate extracting solvent, within seconds after it is removed from the animal. Moreover, with laboratory animals, we can make certain that the animal is in good health before it is killed. In the case of human beings, however, with the exception of accident victims, the opposite is usually true. A patient who is unconscious for days before death undoubtedly shows an indeterminate amount of change in the brain, including edema and autolysis. These facts must be kept in mind in interpreting the comparatively few data available in the literature.

Metabolic Variations in Animal and Human Brain

Irrespective of such problems, let us analyze the material on animal and human brain in an attempt to unravel the mystery of the aging process. To give proper perspective, we must also review the sequence of chemical events in the brain as the animal matures.

Let us first note the changes in the total metabolism of the brain studied in young, mature, and aged rats and human beings.[1] Minced rat brain shows a definite increase to a maximum metabolic rate which is reached at about 30 days of age, after which there is a definite but slow fall.[2-4] Only two reports give information on metabolism of the rat brain after two years of age.[5-6] Since the rat lives approximately thirty times as fast as man, a rat of two years is roughly equivalent to a man of 60.[7] Reiner studied the metabolism of brain homogenates in respect to aging (table 2.)[5] These data, unfortunately, are presented only on a dry weight basis, so that it is not possible to take into account the decrease in water which occurs in the brain throughout life. However, in Reiner's observations, preparations from animals over 2 years old showed a respiration as low as that of homogenates from brains of embryos.

Garbus determined the effect of age on the metabolism of reinforced homogenates of brain with different results.[6] Under these circumstances, the oxygen consumption in animals more than 28 months old did not differ from that obtained with younger adults, 18.0 and 18.4 mm^3/hr./100 mg. respectively. Since these values were only for fortified homogenates and hence show only the maximum ability of the tissue, it is difficult to relate them to the intact brain of the rat, much less to that of a human being. Studies of the cerebral metabolic rate in the intact person have shown that the overall or metabolism of entire brain falls in old age,[8] a metabolic decline

TABLE 2

RESPIRATION OF RAT BRAIN HOMOGENATES IN RELATION TO AGE*

Age (months)	*Embryos*	*0-1*	*2-4*	*4-6*	*6-12*	*12-18*	*18-24*	*Greater than 24*
QO_2 Dry weight	10	14	15	16	15	16	15	10

*From Reiner.[5]

which parallels that of the basal metabolism.

The brain appears to shrink as a person ages. Leontovich concludes from the brains of 228 men, 15 to 92 years of age, and 119 women of 1 to 98 years, that the weight of the brain increases with age until approximately 25 years.[9] After about the age of 30, the size decreases, the decline being greater in men than in women (table 3). Essentially the same data have been reported by Bürger.[10] He quotes Böning, who showed that, as the person ages, the difference between the skull capacity and the brain volume increases.[11] Heinrich found that the ventricles of the brain are enlarged in old age with the end result that the total volume of cerebrospinal fluid increases, while that of brain tissue contracts.[12] Bürger points out that this condition may be called a "physiological hydrocephalus."

TABLE 3
AVERAGE BRAIN WEIGHT*

Age (yrs.)	*Men (gm.)*	*Women (gm.)*
1-30		1240
15-30	1377	
31-50	1354	1201
52-92	1318	1183

*Adapted from Leontovich.[9]

Increase in Water Content

Water is the cerebral constituent present in largest quantity and any change in water will affect the apparent concentration of other substances. For this reason, many investigators present data on metabolism or chemical constitutents on the basis of dry weight. A number of arguments, however, can be marshalled against this point of view. Most important are the facts that all reactions of the body take place in an aqueous medium and that it is only on the fresh tissue basis that we can observe variations in metabolism.[13]

Water in the brain is highest during embryonic and fetal life, and generally declines up to and through middle life. Donaldson's classic observations show the decrease in percentage of water in rat brain throughout the first year of life (table 4).[14] Koch and Riddle analyzed pigeon brain through approximately five and one-half years of life.[15] Graves and Himwich have shown the relative decrease in water content of the various parts of the rabbit brain up to 4 years of age.[16] Additional data from our laboratory now cover the age of 5 years, 4½ months in the rabbit. In general, the decrease in water follows a phyletic progression in that the medulla and superior colliculi are the driest at birth and continue to be the driest throughout life. However, the newer parts of the brain, such as the cortical gray and the caudate nucleus, although progressively losing moisture, tend to have more water at any given time than the older parts such as the medulla.

Data on brains from human beings between 67 and 84 reveal that the percentage of water content tends to follow the same sort of phyletic distribution seen in the rabbit.[17] More recent observations suggest that there is no significant change in the aqueous content of the various cerebral areas between the ages of 68 and 84. Koch and Voegtlin analyzed human brains for water and found that water falls from 89 per cent at 6

TABLE 4
WATER PER CENT OF RAT BRAIN IN RELATION TO AGE*

Days	*Birth*	*10*	*21*	*31*	*41*	*100*	*250*	*365*
Per cent of water	88.00	86.72	82.49	80.19	79.36	78.55	78.01	77.50

*From Donaldson.[14]

TABLE 5

WATER CONTENT OF CORTICAL GRAY AND WHITE MATTER IN RELATION TO AGE*

(Per cent fresh tissue)

Matter		1 yr.	2-5 yrs.	10-16 yrs.	19-55 yrs.	65-76 yrs.	78-90 yrs.
Gray	Number of brains	2	3	4	2	4	3
	Water percentage	89	87	84	84	86	87
White	Number of brains	3	3	4	4	3	2
	Water percentage	85	75	69	71	71	74

*Calculated from Brante.[20]

weeks to 76 per cent at 54 years.[18] MacArthur and Doisy have studied human brains up to 67 years of age.[19] Brante also determined the water content of cortical gray and white matter in individuals as old as 90 years.[20] The values calculated from his data are shown in table 5. The most interesting finding is the increase in water content in the oldest group of patients, from 78 to 90 years of age.

Bürger reported that the water content of the entire brain of the newborn infant is 90 per cent and falls until puberty, then reaches a level of 76 per cent at 21 to 30 years.[10] With old age, 71 to 80 years, the moisture content rises again to about 78 per cent. Finally, in the 85 to 90 age group, the value for women goes still higher, whereas that for men drops a little. Bürger's work was done on 13 men and 13 women in the 85-to-90 age group, so even though these changes are slight, they are significant. In all, he studied the brains of 197 men and 179 women. These data are difficult to compare with those of Brante, for he worked with white and gray matter separately.[20] The "physiological hydrocephalus" accounts in part for the higher water content of the older brains, but it does not completely explain the fact that our analysis of Brante's data revealed that both white and gray of the cerebral cortex show an accumulation of moisture in old age.[1]

Tilney and Rosett analyzed the cerebral hemispheres, cerebellum, and the brain stem of human brain from birth through 76 years.[21] All three areas exhibited the changes in water content described by other investigators. The brain stem, however, was drier throughout life than was the cerebellum, which was in turn drier than the cerebral hemispheres. These results substantiate the phyletic distribution of water in the various cerebral areas described.

Growth and Regression in the Lipid Pattern

The next most plentiful brain materials are the lipids. These increase as the brain becomes drier and so bear an inverse relation to the moisture content. The phospholipids are largely extracellular. Donaldson based his conclusions on the position of the phospholipids on both

TABLE 6

CONCENTRATIONS PER KILO OF BRAIN TISSUE OF VARIOUS CONSTITUENTS*

Group	Number of cats	Water (gm.)	Nitrogen (mM)	Chloride (mM)	Sodium (mM)	Potassium (mM)	Phosphorus (mM)	Fat (gm.)
A	9	84.6±5.0	14.7±0.3	43.2±1.4	55.1±1.4	87.0±1.6	76.9±3.7	30
B	8	80.8±4.0	16.8±0.2	39.0±1.0	52.5±1.2	88.0±2.2	96.3±0.5	60

*From Yannet and Darrow.[22]
Group A includes animals weighing up to 800 gm.; Group B, animals weighing from 800 to 2,500 gm.

TABLE 7

TOTAL LIPOID CONTENT IN PER CENT*

Age in years	*1*	*1-10*	*20-30*	*30-40*	*40-50*	*50-60*	*60-76*
Cerebral hemispheres	5.1	9.8	9.9	9.9		10.6	9.5
Cerebellum	4.8	7.1	7.7	7.7	7.9	8.0	7.1
Brainstem	5.5	13.5	12.8	14.0		13.6	14.0
Total brain	5.0	9.6	9.6	10.5	10.4	10.7	9.5

*Adapted from Tilney and Rosett.[23]

chemical and histologic studies of rat brain.[21] Yannet and Darrow studied extracellular fluids as well as sodium, potassium, nitrogen, and phosphorus in the brains of growing kittens (table 6).[22] The decrease in water in the brain with growth is caused by a decline in extracellular fluid while intracellular water remains nearly constant, increasing from 50.7 to only 51.0 per cent. At the same time, sodium and chloride, mainly extracellular, are diminishing, while the chiefly intracellular potassium is unchanged. The rise of phosphorus and nitrogen contents can be largely attributed to accumulation of phospholipids in the developing kitten.

Both Bürger and Brante studied various lipid fractions of brain.[10,20] Bürger used 345 brains from individuals ranging from newborn to 90 years of age. He found that the largest fraction is formed of phosphotides, followed by total steroids and cerebrosides. Toward the end of life, the first two fractions decrease more than the third, with an apparent accumulation of "undefined" lipids in old age. This fraction may represent the lipochromes characteristic of old age. Inspection of Brante's data suggests that the lipid fractions of gray and white matter show the same trends as Bürger's values, but the number of brains studied in each decade of life was too small to permit conclusions.

Bürger notes that various phospholipid fractions reach maximum concentration at different ages, the total steroids at 31 to 40 years, the phosphotides at 51 to 60.[10]

Studies on the total lipoid content of human brain suggest that, while the cerebellum and cerebral hemisphere follow the general rhythm indicated by Bürger for whole brain,[10] the lipoid content of the basal ganglia remains high

TABLE 8

LIPIDS OF CORTICAL GRAY AND WHITE MATTER, HUMAN BRAIN, IN RELATION TO AGE*

(Per cent fresh tissue)

Years	*1*	*2-5*	*10-16*	*19-55*	*65-76*	*78-90*
Gray matter						
Number of brains	2	3	4	2	4	3
Total lipids	3.47	4.62	4.98	5.31	5.60	4.65
Phospholipids	2.14	2.68	3.12	3.28	3.12	2.50
Cerebrosides	0.36	0.51	0.36	1.04†	0.70	0.68
Cholesterol	0.54	0.70	0.75	0.80	0.81	0.68
White matter						
Number of brains	3	3	4	4	3	2
Total lipids	7.54	13.66	18.72	18.00	18.10	15.10
Phospholipids	3.81	6.12	8.22	7.79	7.49	6.82
Cerebrosides	1.36	2.90	4.46	4.07	4.22	3.24
Cholesterol	1.50	3.04	4.50	4.93	5.01	3.67

*Recalculated from Brante.[20] †One value.

TABLE 9

RAT BRAIN PROTEIN IN RELATION TO AGE IN DAYS*

(Absolute weight in milligrams)

Days	*1*	*10*	*20*	*40*	*120*	*210*
Milligrams	15.14	60.45	119.40	136.00	165.20	177.00

*From Donaldson.[14]

through the seventy-sixth year.[23] When the entire cerebrum is considered, the lipid pattern found by Tilney and Rosett[23] follows the accepted picture of growth and regression (table 7).

Again we must turn to Brante's work for the most extensive data available on the white and gray matter of human brain.[20] We have recalculated his data on a wet-weight basis. The quantities of the various lipid fractions in both white and gray matter tend to rise rapidly to the age of 10 to 16, slowly if at all until 65 to 76, and then fall in the 78 to 90 year group (table 8). These values are, of course, tied to moisture content values to which they show an inverse relation. Johnson, McNabb, and Rossiter compared adult human brain with that of the infant and showed that the increase in total lipid concentration balances the decrease in water.[24] Koch and Mann reported an increase in brain lipids for whole human brain with age.[25]

Age and Total Nitrogen Content

Nitrogenous compounds follow the lipids in quantitative importance. Not only do they include proteins, but overlap the phospholipids to some extent. Many investigators have found that the total nitrogen of the fresh brain is augmented as the animal matures. Kelley has reported that, in the rabbit, the nitrogen of the various cerebral areas becomes greater in approximately phyletic order up to 70 days of age.[26] With the exception of the cerebellum, the nitrogen content of the cerebral areas increases with age in a cephalad direction. Unpublished data from our laboratory on the total nitrogen content of frontal cortex, medulla, right caudate nucleus, and right thalamus from brains of persons 66 to 87 years suggest that, on a wet-weight basis, a diminution of total nitrogen occurs in these areas of the brain in those persons over 84. Calculated on dry weight, total nitrogen in whole human brain declines precipitously from 2 to 5 years, then levels off and remains quite constant until 60 years, after which time it falls again.[10]

Donaldson, who studied the protein content of rat brain, reports an increase in this constituent similar to that of total nitrogen (table 9).[14] Results of protein determinations on human brain up to the age of 67 are also available from the work of MacArthur and Doisy.[19] As in experimental animals, cerebral protein accumulates in developing man, reaching a maximum at 21, and decreasing somewhat by 67 years (table 10). Bürger reports two peaks in the protein content of brains on a wet-weight basis, one at

TABLE 10

TOTAL PROTEIN IN PERCENTAGE OF FRESH TISSUE HUMAN BRAIN IN RELATION TO AGE*

Fetus		*Infant*			*Adult*			
3 months	*7 months*	*1 month*	*3 months*	*8 months*	*21 years*	*33 years*	*35 years*	*67 years*
3.77	3.98	4.57	5.29	6.09	8.03	8.11	8.99	7.53

*From McArthur and Doisy.[19]

TABLE 11

ESTIMATED PROTEIN CONTENT OF CEREBRAL GRAY AND WHITE MATTER IN RELATION TO AGE

(Per cent fresh human tissue)

Years	*1*	*2-5*	*10-16*	*19-55*	*65-76*	*78-90*
Gray matter						
Number of brains	2	3	4	2	4	3
Estimated protein content	7.08	8.34	10.89	12.00	8.51	8.39
White matter						
Number of brains	3	3	4	4	3	2
Estimated protein content	7.62	11.57	10.96	11.60	10.90	10.40

Calculated from data of Brante.[20]

6 to 10 years, with a fall at 11 to 15 years, which continues to 16 to 20 years, and a second lower one from 21 to 30 years.[10] After this time, there is a slight but definite diminution in proteins throughout middle and old age, up to 90 years.

From the work of Brante, it is possible to arrive at an estimate of the protein content of white and gray cerebral cortex (table 11).[20] These figures are obtained by assuming that protein represents the largest and most variable constituent in the difference arrived at by subtracting the weight of total lipids from the dry weight. This fraction of the brain actually represents all constituents not soluble in lipid solvents, and includes all acid-soluble substances as well as proteins. Although these acid-soluble substances may fluctuate with age, they are relatively small in quantity in comparison to proteins.

The protein fraction acquired in this way will not contain the proteolipids which are soluble in lipid solvents.[27] The calculated data show the expected protein content increase from birth to the 19- to 55-year period, and then indicate a slight decrease in both white and gray of the cortex. Similar results have been found by other students of human brain. Block's studies on composition suggest that the protein, although decreasing in quantity, remains unchanged as to amino acid content.[28]

Changes in the Spinal Cord and Sciatic Nerve

The spinal cord shows a progressive pattern of moisture loss which is roughly parallel to that of brain, although the cord contains less aqueous material throughout life. The sciatic nerve, however, discloses a different picture. The 158 sciatic nerves analyzed by Bürger dried at a fairly constant rate after 10 years of age, before which time they lost water about three times as fast.[10] The lipid content of the spinal cord reaches a maximum at the ages of 21 to 30 and remains at the same level until the age of 84, after which there is a suggestion of a slight increase. The sciatic nerve, on the other hand, shows a rapid accumulation of lipids from the ages of 31 to 40 through 90. At this time, these constituents make up more than 70 per cent of the dry substance of the nerve. Bürger called this condition "lipomatosis."[10]

Sulfur and Phosphorus Content

Total sulfur on a dry-weight basis presents one of the most interesting patterns.[10] After a very rapid diminution to 2 years, it rises rapidly until 40 to 50 years, after which the decline is gradual until 75, when sulfur-rich substances again accumulate. We do not as yet have sufficient knowledge of the sulfur-containing compounds of brain to interpret

these findings. Bürger feels that these materials may be noncombustible, or clinker, substances such as chondroitic acid (chondroitin plus sulfuric acid). Similar sulfur compounds are known to be deposited in the aortas of the elderly. There is quite a pronounced difference in the changes shown by men and women for total sulfur. The variations in women are in the same direction but are more pronounced than those in men. The ages at which the changes occur, however, suggest that they are not linked to the sex hormones.

The total phosphorus picture on a dry-weight basis shows a rather high level at birth, a minimum value at 2 to 3 years, a maximum at about 45 years, and then a steady diminution to 90 years.[10] Total phosphorus expressed in this way reflects the reverse side of the change in water content and incorporates both the changes in phospholipid and phosphoprotein as well as other phosphorus-containing compounds.

As the brain ages, in man and animals, a yellow pigment, probably a lipochrome, is deposited.[29] Its rate of production is apparently faster than the ability of the brain to destroy it. The first traces of the yellow plaques are seen in children 6 to 7 years of age, and they later become widespread through the central nervous system.[30] The pigment is present in the cytoplasm of a wide variety of neurones but apparently has no effect on their function.[30] In the brains of dogs, an apparently identical substance appears at about 10 years of age.[29] In dogs there is also a nongranular substance, probably a mucoprotein, which increases with age. These substances may be studied by using the periodic acid-Schiff reagent.

The Role of PNA

Micromethods have shown that, as the brain ages, the PNA, or pentose nucleic acid, decreases.[30] There are large amounts of pentose nucleoprotein in the neurones, which may be necessary for normal neuronal activity. A diminution in this important substance at a time when the yellow pigment is increasing may point to a decrease in neuronal activity with age. Additional data from our laboratory indicate a fall in free glutamic acid in rats 2½ years old. Since glutamic acid takes part in the detoxication of ammonia and since it is the most abundant free amino acid in brain, this decrease may be of importance in the aging animal. All evidence suggests a real change in the various protein fractions with age. It is possible that there is also a lesser number of cells in the cortical layers, although technics of counting cells are open to question.[31,32] Brody and others have reported that neuronophagia goes on all through life, not only with the disappearance of cells, but also of myelinated processes.[31-38] If this destruction is accelerated in old age, it is not surprising that there are such shifts in water, total lipid, and protein.

We may summarize the total picture for the ninth decade of life as being a period when nitrogen and phosphorus-poor, but sulfur-rich substances, are accumulating rapidly. The well-defined lipid fractions, however, and the total protein are declining. Some "undefined lipid," perhaps the lipochrome of the yellow plaques, is being augmented. The cell and axon population is dwindling, the aqueous element is expanding to take up space in the skull cavity, and the ventricles are enlarging. The overall picture is one of loss of many constituents; the brain is actually dwindling in size. It is no wonder that mental abilities are impaired.

Need for Further Research

The paucity of data on the effects of age on the brain points to our great need for further research in this field. We need studies on brains of aged animals from

various species to distinguish those changes characteristic of a given species from those which are the inevitable concomitants of aging. Even more than this, we need to analyze human brains at all ages and under a variety of pathologic conditions. By the zealous pursuit of these lines of research, we can hope to elucidate the effects of aging. Rational treatment must be preceded by a clear understanding of the functional pathology.

A portion of this review has already been published,[1] but a considerable amount of new material has been added.

REFERENCES

1. HIMWICH, H. E., and W. A. HIMWICH: Brain metabolism in relation to aging. J. Chron. Dis. 3: 487-498, 1956.
2. TYLER, D. B., and A. VAN HARREVELD: The respiration of the developing brain. Am. J. Physiol. 136: 600, 1942.
3. HIMWICH, H. E., Z. BAKER, and J. F. FAZEKAS: Respiratory metabolism of infant brain. Am. J. Physiol. 125: 601, 1939.
4. CHESLER, A., and H. E. HIMWICH: Comparative studies of the rates of oxidation and glycolysis in the cerebral cortex and brainstem of the rat. Am. J. Physiol. 141: 513, 1944.
5. REINER, J. M.: The effect of age on the carbohydrate metabolism of tissue homogenates. J. Gerontol. 2: 315, 1947.
6. GARBUS, J.: Respiration of brain homogenates of old and young rats. Am. J. Physiol. 183: 618, 1955.
7. DONALDSON, H. H.: A comparison of the albino rat with man in respect to the growth of the brain and of the spinal cord. J. Comp. Neurol. 18: 345, 1908.
8. KETY, S. S.: Human cerebral blood flow and oxygen consumption as related to aging. J. Chron. Dis. 3: 478-486, 1956.
9. LEONTOVICH, A. V.: Brain weight and ages. Theses of conference papers on the problem of source of senility and the prophylaxis of premature aging of the organism. Kiev. Acad. Sci. Ukraine SSR. Trans. at NIH for Dr. J. E. Birren.
10. BURGER, M.: The chemical biomorphosis of the central nervous system of humans. Die Medizinische. 561-7, 1956.
11. BONING, H.: Z. Neurol. 94: 72, 1925, quoted by Bürger.[10]
12. HEINRICH, A.: Alterns vorgänge im Röntgenbild. Leipzig, Thieme, 1941, quoted by Bürger.[10]
13. HIMWICH, H. E.: Brain metabolism and cerebral disorders. Baltimore: The Williams & Wilkins Co., 1951.
14. DONALDSON, H. H.: The rat. Memoirs of the Wistar Institute of Anatomy and Biology, No. 6; Philadelphia, 1954.
15. KOCH, MATHILDE L., and O. RIDDLE: Further studies on the chemical composition of the brain of normal and ataxic pigeons. J. Comp. Neurol. 31: 83, 1919-20.
16. GRAVES, J., and H. E. HIMWICH: Age and the water content of rabbit brain parts. Am. J. Physiol. 180: 205, 1955.
17. HIMWICH, W. A., W. T. SULLIVAN, B. KELLEY, H. B. W. BENARON, and B. E. TUCKER: Chemical constituents of human brain. J. Nerv. & Ment. Dis. 122: 441, 1955.
18. KOCH, M. L., and C. VOEGTLIN: Chemical changes in the central nervous system in pellagra. Bull. No. 103, Hygienic Laboratory, Washington, 51, 1916.
19. MAC ARTHUR, C. G., and E. A. DOISY: Quantitative chemical changes in the human brain during growth. J. Comp. Neurol. 30: 445, 1918-1919.
20. BRANTE, G.: Studies on lipids in the nervous system with special reference to quantitative chemical determination and topical distribution. Acta physiol. scandinav. 18: Suppl. 63: 1-189, Upsala, 1949.
21. DONALDSON, H. H.: A preliminary determination of the part played by myelin in reducing the water content of the mammalian nervous system (albino rat). J. Comp. Neurol. 26: 443, 1916.
22. YANNET, H., and D. C. DARROW: The effect of growth on the distribution of water and electrolytes in brain, liver and muscle. J. Biol. Chem. 123: 295, 1938.
23. TILNEY, F., and J. ROSETT: The value of brain lipoids as an index of brain development. Bull. Neurol. Inst. N. Y. 1: 28-71, 1931.
24. JOHNSON, A. C., A. R. MC NABB, and R. J. ROSSITER: Concentration of lipids in the brain of infants and adults. Biochem. J. 44: 494, 1949.
25. KOCH, W., and S. A. MANN: A comparison of the chemical composition of three human brains at different ages. J. Physiol. 36: 36, 1907.
26. KELLEY, B.: Age and nitrogen content of rabbit brain parts. Am. J. Physiol. 185: 299-301, 1956.
27. FOLCH, J., and M. LEES: Brain proteolipids, a new group of protein-lipide substances soluble in organic solvents and insoluble in water. Fed. Proc. 9: 171, 1950.
28. BLOCK, R. J.: Chemical studies of neuroprotein. J. Biol. Chem. 120: 467, 1937.
29. SULKIN, N. M.: The properties and distribution of PAS positive substances in the nervous system of the senile dog. J. Gerontol. 10: 135, 1955.
30. HYDEN, H.: Neurochemistry. Springfield: Charles C Thomas, 1955, 204-233.
31. BRODY, H.: Organization of the cerebral cortex. III. A study of aging in the human cerebral cortex. J. Comp. Neurol. 102: 511, 1955.
32. KUHLENBECK, H.: Some histologic age changes in the rat's brain and their relationship to comparable changes in the human brain. Confinia Neurol. 14: 329, 1954.
33. CORBIN, K. B., and E. D. GARDNER: Decrease in the number of myelinated fibers in human spinal roots with age. Anat. Rec. 68: 529, 1937.

Changes of physical fitness and cardiovascular functions with age

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The decline of working capacity and performance for people over 40 is compared for various types of work. The physiologic mechanisms involved in the performance drop, the possibility of counteracting aging processes by training, and the relationship between heart disease and aging processes are discussed.

◆ The maintenance of physical fitness with age has become an important national problem because of the increasing proportion of older population. Is the increasing life span paralleled by a better maintenance of physical fitness?

Precise information on this fundamental question is scanty. Such long-range studies should have been started fifty or one hundred years ago, but at that time the steady increase of life expectancy could not be predicted and many of the important methods for testing physical fitness were not available.

Muscle Strength

There is, however, some information on muscle strength, which was studied in Belgium by Quetelet[1] in 1836, and by Rejs[2] in Holland in 1921. Holland and Belgium are geographically very close, and the population is stable in both countries. During those eighty-five years the life expectancy increased in Holland from 34.9 to 55.1 years.[3] No data for Belgium are available for the whole period, but from 1881 to 1890, and from 1891 to 1900, the life expectancy in Belgium and Holland was essentially the same. The decline of muscle strength at the age of 37 in 1826, 90 per cent of peak, was about the same as at the age of 50 in 1921. This suggests that the increased life expectancy was paralleled by a better maintenance of muscle strength. However, the improved life expectancy is largely caused by lower infant mortality, and therefore the data are not conclusive for older population.

More recent information on this question was made availble by Jokl.[4] He compared the performance of 1,566 athletes over 40 at a Deutscher Turner Bund tournament in 1952 with performance records at the tournament in 1928. This is, of course, a highly selected

TABLE 1
AGE DISTRIBUTION OF GERMAN ATHLETES OVER 40

Year	*40 to 51 years*	*Over 51*
1928	98.5%	1.5%
1952	40.0%	60.0%

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group but the principle of selection, essentially enjoyment in physical exercise, probably was not much different in 1928 and 1952. There was a notable shift in the age distribution of the participants. The percentage of athletes over 51 increased by 30 times from 1928 to 1952 (table 1). At the same time, the maintenance of performance with age was improved, as shown in table 2, for three types of exercise. In 1952, athletes 49 years old equaled the performance of 40-year-old athletes in 1928. In part, the improved performance in 1952 may be the result of improvement of technic, but, taken all in all, Jokl's data are suggestive of a biologic factor.

These types of exercise are performed within a few seconds, which is much too short for mobilization of circulation and metabolism. Occupational work and types of endurance work involving cardiovascular functions are much more important for an over-all estimate of physical fitness, but unfortunately, such information was not given.

TABLE 2

AGE OF GERMAN ATHLETES IN 1952, WITH EQUIVALENT PERFORMANCE OF ATHLETES OF 40 IN 1928

Type of performance	*Performance*	*Age of men with equivalent performance*
75 meter dash	10.7 sec.	49
Shot putt	8.3 min.	49.5
Jump	4.64 min.	48

Endurance Work

Improved maintenance of physical fitness in types of endurance work may be suggested by a recent analysis of Belbin.[5] His findings indicate a higher employment rate for workers over 40 in heavy industrial occupations than for workers in the same age bracket engaged in light operations. The already increased pressure for a higher retirement age may well be partly the result of an underlying, though little noticed, biologic trend toward better maintenance of physical fitness. This, however, should not cloud the fact that physical fitness does decrease with age. Dawson performed one of the most interesting longitudinal experiments on the decline of fitness with age.[6] At the ages of 41, 53, 57, 68, and 71, he performed maximum work on the bicycle ergometer during a testing period of thirty minutes. This type of endurance exercise depends not only on metabolic and circulatory capacity, but also on the willingness of the subject to exert himself. Since this is not questionable in Dawson's case, this series is particularly valuable. Table 3 shows a very sharp drop of his work performance from 41 to 71 years. At the same time, Dawson noticed a considerable increase in the recovery time.

Dawson's results are compared in table 3 with the drop of the maximum oxygen intake in another noteworthy longitudinal experiment by Dill.[7] His maximum O_2 intake dropped only 14 per cent from 37 to 50 years, as compared with an interpolated drop of 25 per cent at the age of 50 which was Dawson's endurance record. Dill's self-observation coincides fairly well with Robinson's results[8] on different subjects for the oxygen intake per minute and kilogram body weight at rest, during walking (aerobic work), and running (maximum intake), as shown in table 4. The basal metabolic rate is usually referred to body surface, but for better comparison with work

TABLE 3

EFFECT OF AGE ON ENDURANCE AND ON MAXIMUM O_2 INTAKE

*Bicycle ergometer performance**			*Maximum O_2 intake†*		
Age	*Kg. M*	*Per cent*	*Age*	*O_2 (l./min.)*	*Per cent*
41	55000	100	37	3.28	100
57	33074	60	44	3.26	99
71	28600	52	50	2.87	86

*Dawson. †Dill.

TABLE 4

OXYGEN INTAKE* AT REST, DURING AEROBIC WORK,† AND DURING ANAEROBIC WORK‡

		Rest		Walking		Running		
Mean age	*Subject no.*	*Absol.*	*%*	*Absol.*	*%*	*Absol.*	*%*	*%*
24.5	10	3.56	100	27.1	100	48.7	100	
35.1	10	3.14	88	25.3	93	43.1	88	100
44.5	10	3.33	94	27.1	100	39.5	81	92
52.1	8	3.28	92	26.4	97	38.4	79	89
63.1	8	3.32	93	28.3	104	34.5	71	80
75.0	3	2.99	84	23.9	88	25.5	52	

*Cubic centimeters per kilogram body weight per minute.
†Walking 5.6 kilometers per hour.
‡Maximum O_2 intake, running.

performance, the reference to body weight is preferred. The resting O_2 consumption drops only slightly up to the mean age of 63, and the O_2 intake in walking, which is an equivalent to mechanical efficiency, does not change at all up to this age. The drop of the maximum O_2 intake is continuous from the age of 25, but only moderate up to the age of 52. In the age span from 35 to 52, the decrease is only 11 per cent. The drop accelerates from 52 years and particularly over 63 years.

There is, by the way, no contradiction between declining ability of the aging to perform extreme exercise and good maintenance of heavy industrial performance in older workers,[5] for, even in hard industrial work, the average load level is far lower than that of years ago. The much greater endurance drop in Dawson's experiment than that of the maximum oxygen intake in Dill's and Robinson's series is very striking.

I found the endurance of 11 older men with an average age of 53, only about half that of 25 younger men, with an average age of 33.3 years.[9] This agrees quite well with Dawson's results, although the type of work was different. Despite the lower performance, the fusion frequency of flicker, which is related to the excitability of the central nervous system, was more depressed by the exercise in the older men.[10] This suggests that the pronounced drop of endurance with age might be partly caused by a decreased tolerance of the central nervous system. The willingness of subjects to cooperate is not questioned, but a decreased excitability of the nervous system may affect the ability to exert oneself. If so, this may be a protective reaction. It is also possible that sustained, severe exercise, of the type of Dawson's work, produces a greater strain on the heart than short distance running as used for determination of the maximum O_2 intake. In a small group of young men, we found greater changes in spatial electrocardiographic vectors in sustained severe exercise, running at 5 miles per hour over 30 minutes, than in short anaerobic exercise, running for 3 minutes 7 to 8 miles per hour, 5 to 10 per cent grade.[11] An age trend in electrocardiographic changes during severe, sustained work appears very likely, since an age

TABLE 5

EFFECT OF METHYL TESTOSTERONE* ON CHARACTERISTICS RELATED TO WORK PERFORMANCE

Item	*Group A*†	*Group B*†	*Group C*†
Weight lifting	+72.8%	68.5%	
Weight holding	51.3%	41.1%	
Muscle strength	46.8%	7.7%	0
Treadmill run			0
Flicker fusion, flashes per sec.	6.4	3.8	

*Treatment with methyl testosterone for six to forty weeks in group A, for four weeks in group B, and for eleven weeks in group C.
†Group A—6 older men, normal but easily fatigued.
Group B—4 eunuchoids and castrates 21 to 47 years old.
Group C—4 normal men, 21 to 30 years old.

trend was found in a moderate type of work such as walking.[12] Figure I shows the typical response of a young man, R.M., and that of an older man, E.W.

The ST segment, particularly in V_5, is more depressed in the older man, and the right shift of the T axis is more pronounced. The tendency to greater ST depression in older men was found also by Silver and Landowne.[13]

The endocrine system seems to be involved in the decline of muscle strength and performance with age.[14] Oral administration of methyl testosterone over a period of several weeks or months, in 6 men over 50 years resulted in a significant increase in weight lifting ability, in weight holding ability, and muscle strength. This was similar to the effect in 4 younger eunuchoids[14a] (table 5).

In contrast, the treatment had no effect on 4 normal young men.[14b] The six older men were preselected because they complained of excessive fatigability, although a thorough clinical examination failed to reveal any sign or symptoms of disease. Logically, then, endocrine deficiency might also be involved in the performance drop of the majority of older men, though to a lesser extent than in this group of six men.

Maximum Oxygen Intake

As an objective method for general appraisal of physical fitness, the maximum O_2 intake is one of the most important functions, since it determines the maximum load level at which sustained work can be performed. It depends largely, but not exclusively, on the cardiac output.[15] Severe work, with a load level exceeding that of maximum O_2 intake, is performed with energy reserves stored up in the muscles, resulting in rapid fatigue partly caused by an accumulation of metabolic nonoxidized products. Therefore, this type of exercise is classified as anaerobic. Work below that level, or, "aerobic work," can be carried out at a steady state of equilibrium of oxygen intake and oxygen demand for a prolonged time. The ultimate fatigue is caused by different factors, including the tolerance of the central nervous system, as discussed before.

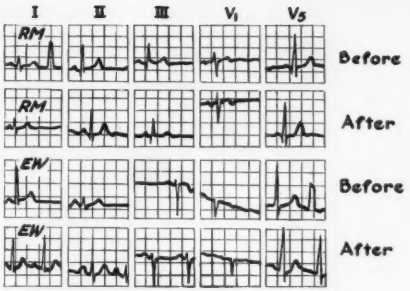

FIG. 1. *Electrocardiograms before and after exercise of a young man (RM) and an older man (EW). EW shows a greater ST depression in lead 2 and V_5, and a right axis shift of the T wave after exercise (taken from reference 12, page 586).*

There is, however, no sharp dividing line between aerobic and anaerobic work. At a steady state of work with light load, the condition might be close to ideally aerobic, but with increasing severity, the work performance becomes more and more anaerobic, as can be demonstrated by the increasing level of blood lactate. This situation is illustrated in figure II for trained men, for normal untrained young men, for normal older men or for detrained younger men, and for cardiac patients. This graph was prepared on the basis of available information from various sources, but does not represent actual experiments. The ordinate shows the maximum oxygen intake which is equivalent to the work load. The stippled areas with increasing density show the transitional zone of work loads from aerobic to anaerobic condition and the arrows show the limit for sustained performance.

In decompensated cardiac patients, even a light work load is partially anaerobic. In trained athletes, the aero-

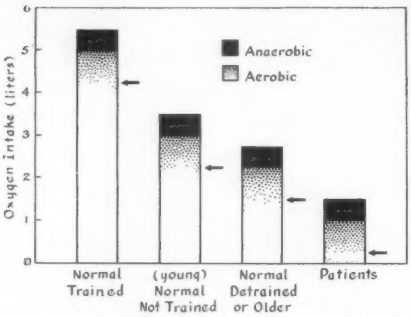

FIG. II. *Working capacity in terms of maximum oxygen intake (margin of black areas) depending on physical condition. Stippled areas show transition from aerobic to anaerobic condition.*

bic performance level is much higher than the maximum O_2 intake of normal older men. The detraining in normal young men was produced by three weeks of bed rest.[17] Older men were not included in this series, but, if anything, a more pronounced detraining effect should be expected. Detrained older, but otherwise normal, men should show a performance range similar to many slightly decompensated cardiac patients. Specific experimental information would be very desirable. Figure II shows typical examples, but actually the work capacity of these different population groups is widely overlapping. This is illustrated in figure III, which has been prepared from the available information, although it does not represent actual experimental data.

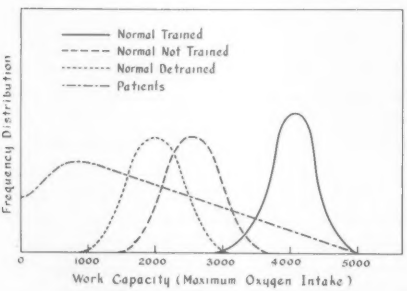

FIG. III. *Schematic diagram of distribution of work capacity, defined by the maximum O_2 intake, in population samples with different level of physical fitness.*

Figures II and III bring out the very important fact that the effects of age and cardiovascular disease are parallel, and the effects of training and aging are opposite in direction.

Training and Age Changes

It appears that training will counteract the effect of age on physical fitness. This conforms to general experience. Few untrained younger men will match the performance of trained older men. On the average, a trained man of 60 will run faster than an untrained man of 40.[4] This applies to the maintenance of performance through continuous training into higher age.

The response to training in younger and older men is another related question. Experimental information on this very fundamental question is still missing. To the best of my knowledge, no comparison large enough for statistical evaluation has been made of metabolic or cardiovascular training effects in moderate and hard exercise, performed in rigidly standardized laboratory conditions, between groups of younger and older men. Some studies in regard to finer motor coordination and intellectual capacities are available. One of my earlier papers might therefore be of interest.[18]

In 1926, I studied the rate of repayment of O_2 debt of Dr. O. Riesser, 47, and myself, 28, during four weeks of training in lifting 12.5-kg. weights. Training produced about the same acceleration of the debt payment in both subjects. Twenty years later Berg found a decline of metabolic recovery speed after 20 years of age.[19] Putting both series together, it is reasonable to imply that training will counteract the age trend in this fundamental function.

TABLE 6

EFFECT OF AGE AND HEART DISEASE ON PERFORMANCE AND RELATED PHYSIOLOGIC FUNCTIONS

Performance, physiologic function	*Age*	*Cardiovascular disease*
Motor coordination		
Small muscles	Unchanged[19-22]	Probably unchanged
Larger muscles	Well maintained[4]	Probably little changed
Speed repetitive movements, small muscles	Slight decreased[22,23]	Moderately decreased[24]
Muscle strength	Decreased[1,2,25]	Probably slightly decreased
Endurance, static work	Unchanged[10]	Probably little changed
Endurance, moderately heavy work	Decreased[6]	Decreased[26]
Pulse rate recovery	Delayed[8]	Delayed[26]
Oxidative recovery	Delayed[18]	Delayed[26]
Respiratory efficiency	Decreased[8]	Decreased[26]
Mechanical efficiency	Unchanged[8]	Unchanged or moderately decreased*[26]
Speed of initial increase of O_2 consumption in work	Delayed[8]	Delayed
Cardiac stroke volume	Decreased	Decreased
Maximum O_2 intake	Decreased[8]	Decreased
Flicker fusion frequency	Decreased[28-31]	Decreased[32-34]

*Dependent on degree of decompensation to severity of work.

Since the involvement of physiologic functions in different types of work varies widely, different age trends for different types of work should be expected. This was already discussed for endurance, maximum O_2 intake, and mechanical efficiency.

Performance, Physiologic Functions, and Cardiac Disease

Table 6 shows a more comprehensive listing of the decline in various types of performance and related physiologic functions with age compared with the effects of cardiac disease. The references in the table are representative and not complete. In some aspects, precise information is still missing, such as that on the effect of heart disease on motor coordination. In such items, the probable effects are listed as based on the judgment of experienced observers. In general, the effect of normal aging has been studied in a greater number of performance types and the effect of heart disease in a greater number of metabolic and cardiovascular functions. Even with such limitation, the parallelism of age effects and of cardiovascular disease is remarkable. In other types of impairment, such as nutritional deficiencies, the profile of disturbance of various performance types and related functions is quite different.[35] The parallelism of effect of age and cardiovascular disease leads to interesting implications. In the general decrease of fitness with age, decrease of cardiovascular capacity and reserve appears to be a very important factor. Since age and cardiovascular disease are synergistic, it might be expected that the same degree of cardiovascular impairment will affect older people to a greater extent. Perhaps deterioration of cardiovascular functions with age may have some bearing on the higher incidence of cardiovascular disease with age.

Since training improves the capacity of physiologic functions related to performance, the possibility of training therapy in older cardiovascular patients

TABLE 7

MEANS AND STANDARD DEVIATIONS OF RELATIVE CREST TIME AND RELATIVE AMPLITUDES AT ONE-FOURTH OF DIASTOLIC PHASE

	Relative crest time (Per cent cycle)		*Relative amplitude (Per cent peak amplitude) One-fourth diastolic phase*	
Group	*M*	*SD*	*M*	*SD*
Y	14.2	3.2	36.8	17.0
O	15.8	2.9	45.4	6.4
H	16.6	4.0	52.4	17.1
PVD	26.4	5.5	79.7	13.2
	Statistical significance			
	t	*p*	*t*	*p*
Y vs. O	5.28	.0001	5.90	.0001
H vs. O	1.54	n.s.	3.14	.01
PVD vs. O	17.27	.0001	13.91	.0001

Abbreviations:
M = means
SD = standard deviation
Group Y = 159 young men
Group O = 267 older men
Group H = 55 patients with arterial hypertension
Group PVD = 34 patients with peripheral vascular disease

is intriguing. Such expectation is well founded in animal experiments in which muscular training improved the capillarity in skeletal muscle as well as in the heart.[36] Improved capillarity of the skeletal muscle will decrease the heart load, and increased capillarity of the heart will increase cardiac reserve. Some encouraging results of muscular training in older cardiac patients have been reported by Landen.[37] However, there must be careful selection of the load, which should be heavy enough to produce training effects, but still below the risk level of overexertion. In this respect, it is interesting to note that of 236 heart patients over 55, 24 per cent of working patients showed improvement and 21 per cent showed deterioration, compared to 14 per cent with improvement and 37 per cent with deterioration in patients who worked only 50 per cent of the time or less.[38] The conclusion was that working apparently did not produce any adverse effects on the course of heart disease.

Functional Limitations During Exercise and Rest

As a rule, functional limitations become more apparent in physiologic stress situations such as exercise, but significant changes of some cardiovascular functions have been found also in resting conditions.

The extensive material on increase of blood pressure with age has been reviewed by Master and his associates.[39] An increased pulse wave velocity with age has been found by Hallock,[40] Wezler,[41] Haynes and coworkers,[42] and Eismayer,[43] and recently confirmed in our material.[44] While greater blood pressure tends to increase the pulse wave velocity, we also found a shorter pulse wave transmission time in older normotensive men, without correlation to the blood pressure. Increase of pulse wave velocity shows increased rigidity of the larger and medium arteries. The decrease of stroke volume and increase of A-V-O_2 differences with age was shown by Cournand and his associates with the direct Fick method.[45] This has been confirmed in a larger series with the dye diffusion method by Brandfonbrener and his coworkers.[46] These authors also found a decrease of the left ventricular work, an increased peripheral resistance, and prolonged circulation time with age.[47]

The I-J force in the ballistocardiogram in older men between 48 and 57 was 24.1 per cent smaller than that of younger men 18 to 26 years old.[48] In contrast to most circulatory functions, we did not find a significant change of the heart rate. The effect of age on peripheral circulation was studied in view of the increased incidence of peripheral vascular disease with age.[44]

The contour of the photoelectrically recorded toe pulse was analyzed in 170 young men between 18 and 27, 270 middle-aged men between 45 and 54, 57 patients with arterial hypertension, and 35

patients with peripheral vascular disease.[44] The contour was generally caused by arteriosclerosis.

Figure IV shows a schematic diagram of a typical pulse curve. The following items were measured: crest-time, absolute and relative in per cent of cycle length; maximum amplitude, and decline of amplitude at one fourth and one half of the diastolic distance D, expressed in per cent of maximum amplitude. Furthermore, the transmission time from the first heart sound to the footpoint of the curve was measured, and from the anatomic distance between heart and toe, the transmission velocity was calculated in terms of meters per second. There were highly significant age differences in all measured items.

Table 7 shows the means and standard deviations of relative cycle length and relative amplitude at one-fourth diastolic distance. In the older group, the speed of the upstroke, as well as that of the downstroke, was significantly slower, and this trend was much more pronounced in the patients with peripheral vascular disease. Some impairment of peripheral circulation was also apparent in the patients with arterial hypertension. A significant increase of the pulse transmission velocity in the older men corroborated earlier information. The results show that peripheral vascular degeneration can be considered an extreme of normal age trends.

Changes in Cerebral Circulation

A similar impairment of circulation with age should be expected in other organs. Thus, decrease of cerebral circulation is more probably involved in the decline of cerebral metabolism, functional deterioration of the central nervous system, and their psychologic correlates. In table 8 we have compared the decline of cerebral circulation with the decrease of the flicker fusion frequency (FFF), computed as average of different experimental series.[28-32] The fusion frequency, as an index of central nervous system excitability, depends on its oxygen supply, as has been repeatedly demonstrated.[50] The correlation is obvious and probably represents a causal relationship. The trend to slower frequency of the oscillations in the electroencephalogram of older people may also be a related phenomenon.[51]

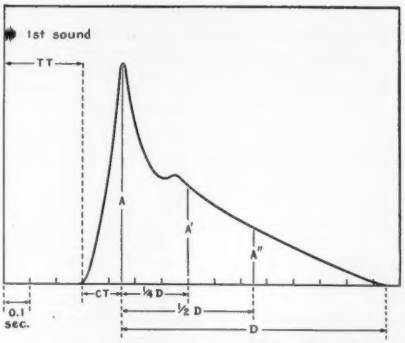

FIG. IV. *Typical digital pulse curve; CT = Crest time; A = Maximum amplitude; A' and A'' amplitudes at ¼ and ½ Diastolic distance (D). Cycle length: CT + D. TT = Pulse wave transmission time.*

Age trends in the resting electrocardiogram were studied in particular detail because the electrocardiogram, more than any other method, refers specifically to the heart, and because of the immediate clinical application. Comparing 157 normal young men between 18 and 25 and 233 men between 45 and 55,

TABLE 8

CHANGES OF CEREBRAL BLOOD FLOW AND FLICKER FUSION FREQUENCY

	Average at age	*Decrease at age*				
Function	*20*	*30*	*40*	*50*	*60*	*70*
Cerebral blood flow[48]	60.0	—6	—10	—12	—14	—16
Flicker fusion frequency*	46.0	—1.3	—2.8	—4.5	—5.8	—9.0

*Average of various authors.[28-31]

TABLE 9

STATISTICALLY SIGNIFICANT MEAN DIFFERENCES OF ELECTROCARDIOGRAPHIC ITEMS BETWEEN 157 YOUNG AND 233 OLDER MEN

Item	*MD*	*t*	*Item*	*MD*	*t*
R_1	+ 1.2	4.7	T_1	—0.5	4.8
R_2	— 3.9	10.8	T_2	—1.0	8.6
R_3	— 4.3	10.6	T_3	—0.7	5.4
S_1	— 0.5	4.9	ΣT	—1.9	7.5
S_2	— 0.3	2.9	T-CF_4	—1.2	4.7
S_3	+ 0.9	8.3	T-axis	—9.9	4.3
Σ QRS	— 7.5	9.5	P-R int.	+0.7	3.2
QRS-axis	—29.0°	10.2	K_{QT}	+0.01	3.9
			$\triangle$R-R	—5.1	5.7

t (0.01) = 2.62; t (0.001) = 3.37
(Amplitudes in mm. [=0.1 mv]: axis in degrees)
MD = statistically significant mean differences

highly significant age differences were found in nearly all of the 43 electrocardiographic items measured.[52] A condensation of the results is given in table 9. This study was recently repeated with analysis of mean spatial QRS and T vectors,[53] constructed from conventional leads by means of a mechanical analyzer.[54] The vectors are expressed in terms of azimuth, elevation, magnitude, and the angle between the vectors. The spatial vector analysis has the advantage of the minimizing positional effects in regard to the amplitude and the important angle between the QRS and T vectors. All 7 items of vector analysis show highly significant age trends. This proves that the decrease of the amplitude, in spatial vectors as well as in conventional leads, is caused by a decrease of the electrical potentials in the heart, and not to a positional effect as suggested by Olbrich.[55] The increase of the angle is of interest because this is in the direction of left ventricular ischemia.

For evaluation of cardiovascular changes with age, the change of the body composition should not be ignored. Although considerable attention was given to this problem in the laboratory,[56] it will not be reviewed extensively here. Suffice it to say that older men are not only heavier, but also fatter. In respect to the electrocardiogram, relative obesity, as estimated from the relative body weight, is a more important factor in older than in younger men. Many more electrocardiographic items show significant changes with relative body weight in the older men than in the younger men, and the slope is steeper.

Electrocardiographic Changes

Although electrocardiographic age trends in healthy population are important for electrocardiographic normal standards, their biologic significance is of great interest. Is there any relationship between the electrocardiographic age trends and the sclerosis of coronary arteries?

Fortunately, one of the most detailed autopsy studies was done in Minnesota by Lober, though independently of our electrocardiographic study. Both groups are comparable, at least in geographical aspects. Lober's study of 536 hearts at the University of Minnesota Hospital is particularly valuable because of the wealth of information provided.[57]

Although in his original paper the age trends were given in terms of a combined rating, Lober made the specific measurements on which the rating is based available to us for statistical evaluation. Among the large group of 536 hearts, there were 21 from individuals 10 to 29 years old, and 20 from persons 40 to 59, who had died from accidents or acute illness. In these subgroups, cardiac disease could be ruled out. Of the items measured, the area of the lumen of coronary arteries, in percentage of the total artery area (lumen plus wall), and the thickness of intima, in percentage of wall thickness, were selected for evaluation (table 10). Both items show a highly significant age trend in the older group: the lumen of the artery is narrower and the intima is thicker.

There is a definite parallelism between the histologic changes in the coronary

TABLE 10

HISTOLOGIC CHANGES OF CORONARY ARTERIES IN NORMAL HEARTS

Age group (years)	*Number hearts*	*Area of lumen in % of artery area*		*Thickness of intima in % of wall thickness*	
		Mean	*SD*	*Mean*	*SD*
10 to 29	21	44.5	7.88	45.5	13.03
40 to 59	20	31.5	8.10	72.5	7.94
MD		—13.0		+27.0	
t		5.2	($p<.01$)	7.8	($p<.01$)

t=statistical significance

SD=standard deviation
MD=mean differences

arteries and the electrocardiographic changes. That this may be a causal relationship is suggested by comparison of electrocardiographic age trends in Minnesota and in Italy.[58] Incidence of advanced coronary sclerosis and of coronary disease is much lower in Italy. Out of a larger number of electrocardiographic items measured, table 11 shows the age differences of three selected items (ΣT or sum of T amplitude in the 3 standard leads; QRS axis, and T axis) in 47 young and 52 older men in Minnesota and in Italy.*

Both electrocardiographic groups were selected at random but matched in number, body weight distribution, and mean age. The Minnesota group in table 11 is part of the larger group in table 9. There was no significant difference between these partial groups and the total groups. In contrast to the highly significant age differences in the Minnesota men, age differences in the Italian sample are very small, although in the same direction, and not statistically significant.

It seems reasonable to suggest that the electrocardiographic trends found in Minnesota are caused by progressive coronary atherosclerosis. Because of the gradual development of coronary atherosclerosis, a gradual transition should be expected rather than a sharp separation between the so-called normal population and patients with coronary heart disease. This is actually the case, for many people with advanced coronary sclerosis do not develop coronary heart disease, but all who do so have advanced arteriosclerotic degeneration. On the other hand, in a high percentage of pa-

*The Italian sample was collected by Dr. Ancel Keys.

TABLE 11

SELECTED ELECTROCARDIOGRAPHIC ITEMS IN 47 YOUNG AND 52 OLDER MEN IN MINNESOTA AND IN ITALY

	Minnesota			*Italy*		
	ΣT mm.	*Axis° QRS*	*Axis° T*	*ΣT mm.*	*Axis° QRS*	*Axis° T*
YM	7.46	68.87	44.85	5.35	42.83	35.04
SD	2.01	17.44	19.92	2.70	30.76	20.86
OM	5.16	45.19	26.65	4.94	35.56	34.85
SD	1.67	29.97	23.66	2.15	26.10	21.77
MD	—2.29	—23.68	—18.19	—0.41	—7.27	—0.19
t	6.2*	4.7*	4.2	0.8	1.3	0.04
Per cent change	—30.9			—7.6		

*Highly significant
YM=young men
OM=older men
SD=standard deviation

M=means
MD=mean difference
t=statistical difference

TABLE 12

MEANS AND STANDARD DEVIATIONS OF SELECTED ELECTROCARDIOGRAPHIC ITEMS IN 15 PATIENTS AND IN 233 NORMAL OLDER MEN

		R_2 mm.	T_1 mm.	T_2 mm.	ΣT mm.	QRS axis°	T axis°	$T\text{-}V_4$ mm.
Group P	M	7.05	1.71	1.46	3.93	11.00	16.67	3.61
	SD	3.79	0.87	0.77	1.35	29.86	33.13	2.24
Group O	M	7.75	2.01	2.26	5.20	37.77	32.87	7.08
	SD	3.16	0.89	0.95	1.74	34.67	23.96	2.49
MD		−0.70	−0.30	−0.80	−1.33	−26.77	−16.20	−3.47
t		0.82	1.27	3.19	2.77	2.92	2.54	1.71
P		0.42	0.21	0.002	0.006	0.005	0.015	0.09

M=means
SD=standard deviations
P=Patients with angina pectoris and normal resting electrocardiograms
O=Older men
MD=mean difference
t=statistical difference

tients with typical angina pectoris, the electrocardiogram is within normal range limits.

In order to acquire more specific information on this important question, we compared selected items in the resting electrocardiogram of 233 older, clinically healthy men and in 15 angina pectoris patients with normal resting electrocardiogram, but with abnormal response to exercise (table 12).[58] All changes in the group of patients are in the direction of normal age trends, and are statistically significant in 4 out of 7 items studied. In another item ($T\text{-}V_4$), the difference approaches statistical significance. Results show that the electrocardiogram is already changed in the initial phase of coronary disease, although the changes are not sufficiently large to move many individual patients outside the normal range limits. The results support the concept of a gradual transition from age trends to coronary heart disease.

That coronary atherosclerosis is not an inevitable age process is shown in the absence of significant electrocardiographic age trends and low incidence of coronary heart disease in Italy and in other countries, as, for instance, among the Bantu.[59] There is, however, strong evidence that it is related to the fat intake.[60] Physical activity may be another factor affecting the development of coronary atherosclerosis, and this leads back to the question of counteracting age trends by physical training. In recent tests in our laboratory, we compared the electrocardiograms taken while resting and after exercise, walking on a treadmill, in 150 railroad clerks (sedentary work) and 150 switchmen (physical work). The incidence of electrocardiographic abnormalities after elimination of men with arterial hypertension was significantly lower in the switchmen than in the clerks.

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REFERENCES

1. QUETELET: Sur l'homme et le dévelopment de ses facultés. Bruxelles: L. Hauman and Cie, 1836.
2. REJS, J. H. O.: Ueber die Veränderung der Kraft während der Bewegung. Pflüger's Arch. ges. Physiol. 191: 234, 1921.
3. DUBLIN, L. I., and A. J. LOFKA: Length of Life. New York: Ronald Press Co., 1936.
4. JOKL, E.: Alter und Leistung. Berlin: Springer-Verlag, 1944. 75 pages.
5. BELBIN, K. M.: Older people and heavy work. Brit. J. Indust. Med. 12: 309, 1955.
6. DAWSON, P. M., and F. A. HELLEBRANDT: The influence of aging in man upon his capacity for physical work and upon his cardiovascular responses to exercise. Am. J. Physiol. 143: 420, 1945.
7. DILL, D. B.: Effects of physical strain and high altitude on heart and circulation. Am. Heart J. 23: 441, 1942.
8. ROBINSON, S.: Experimental studies of physical fitness in relation to age. Arbeitsphysiologie 10: 251, 1938.
9. SIMONSON, E.: Physical fitness and work capacity of older men. Geriatrics 2: 110, 1947.
10. SIMONSON, E., N. ENZER, and R. W. BENTON: The influence of muscular work and fatigue on the state of the central nervous system. J. Lab. & Clin. Med. 28: 1555, 1943.
11. KIMURA, N., and E. SIMONSON: The effect of moderate

and hard muscular work on the spatial electrocardiogram. Am. Heart J. 45: 676-682, 1953.
12. SIMONSON, E.: Effect of moderate exercise on the electrocardiogram in healthy young and middle-aged men. J. Appl. Physiol. 5: 584-588, 1953.
13. SILVER, H. M., and M. LANDOWNE: The relation of age to certain electrocardiographic responses of normal adults to a standardized exercise. Circulation 8: 510, 1953.
14. SIMONSON, E., W. N. KEARNS, and N. ENZER: Effect of methyltestosterone treatment on muscular performance and the central nervous system of older men. J. Clin. Endocrinol. 4: 528, 1944. (a) SIMONSON, E., W. M. KEARNS, and N. ENZER: Effect of oral administration of methyltestosterone on fatigue of eunuchoids and castrates. Endocrinology 28: 506, 1941. (b) SAMUELS, L. T., A. F. HENSCHEL, and A. KEYS: Influence of methyltestosterone on muscular work and creatin metabolism in normal young men. J. Clin. Endocrinol. 2: 649-654, 1942.
15. TAYLOR, H. L., E. BUSKIRK, and A. HENSCHEL: Maximal oxygen intake as an objective measure of cardio-respiratory performance. J. Appl. Physiol. 8: 73-80, 1955.
16. ABRAMSON, D. I., R. W. KEETON, W. H. COLE, H. H. MITCHELL, J. M. DYNIEWICZ, M. C. GEPHARDT, S. J. PRESLEY, and W. R. KEANEY: Value of blood and urine lactate response to physical effort as an index of physical fitness. J. Clin. Invest. 28: 767, 1949.
17. TAYLOR, H. L., A. HENSCHEL, J. BROZEK, and A. KEYS: Effects of bed rest on cardiovascular function and work performance. J. Appl. Physiol. 2: 223, 1949.
18. SIMONSON, E., and O. RIESSER: Zur Physiologie der Uebung. Pflüger's Arch. ges. Physiol. 215: 752, 1927.
19. BERG, W. E.: Individual differences in respiratory gas exchange during recovery from moderate exercise. Am. J. Physiol. 149: 597, 1947.
20. ASCHER, L., and P. BAUMGARTEN: Beiträge zur Kenntnis der körperlichen Beschaffenheit der arbeitenden Bevölkerung. Veröff. Med. Verwalt. 19: 487, 1925.
21. STIEGLITZ, E. J.: Aging as industrial health problem. J.A.M.A. 116: 1383, 1941.
22. KOSSORIS, M. D.: Relation of age to industrial injuries. Monthly Labor Rev. 51: 789, 1940.
23. MILES, W. R.: Performance in relation to age. Pub. Health Rep. Suppl. No. 168, 34 pages, 1943.
24. SMITH, K. R.: Age and performance in a repetitive manual task. J. Appl. Psychol. 22: 295, 1938.
25. SIMONSON, E., and N. ENZER: The state of motor centers in circuatory insufficiency. Arch. Int. Med. 68: 498, 1941.
26. BURKE, W. E., W. W. TUTTLE, C. W. THOMPSON, C. D. JANNEY, and R. J. WEBER: The relation of grip strength and grip strength endurance to age. J. Appl. Physiol. 5: 628, 1953.
27. SIMONSON, E., and N. ENZER: Physiology of muscular exercise and fatigue in disease. Medicine, 21: 346, 1942.
28. SIMONSON, E., N. ENZER, and S. S. BLANKSTEIN: Influence of age on the fusion frequency of flicker. J. Exp. Psychol. 29: 252, 1941.
29. BROZEK, J., and A. KEYS: Changes in flicker-fusion frequency with age. J. Consulting Psychol. 9: 87, 1945.
30. MISIAK, H.: Age and sex differences in critical flicker frequency. J. Exper. Psychol. 37: 318, 1947.
31. COPPINGER, N. W.: The relationship between critical flicker frequency and chronologic age for varying levels of stimulus brightness. J. Gerontol. 10: 48, 1955.
32. ENZER, N., E. SIMONSON, and S. S. BLANKSTEIN: Fatigue of patients with circulatory insufficiency, investigated by means of the fusion frequency of flicker. Ann. Int. Med. 16: 701, 1942.
33. KRASNO, L. R., and A. C. IVY: Response of the flicker fusion threshold to nitroglycerin and its potential value in the diagnosis, prognosis, and therapy of subclinical cardiovascular disease. Circulation 1: 1267, 1950.
34. KEYS, A., and E. SIMONSON: The flicker fusion frequency and its response to nitroglycerin in normal subjects and in patients with cardiovascular disease. Circulation 5: 215-224, 1952.
35. SIMONSON, E.: Influence of nutrition on work performance. Nutrition Fronts in Public Health, Nutrition Symposium Series, No. 3, The National Vitamin Foundation, Inc., 1951, pages 72-114.
36. PETREN, T., and B. SYLVEN: Weitere Untersuchungen über den Einfluss des Trainings auf die Kapillarisierung der Herzmuskulatur. Morphol. Jahrb. 80: 439, 1937.
37. LANDEN, H. C.: Ueber die Bedeutung des Trainingsfaktors in der Gesamtkreislaufleistung alter Personen. Deutsche med. Wchnschr. 68: 168, 1942.
38. BRONSTEIN, L. H., L. J. GOLDWATER, and B. KRESKY: Occupational potentialities of the older cardiac patient. Geriatrics 8: 252, 1955.
39. MASTER, A. M., C. I. GARFIELD, and M. B. WALTERS: Normal blood pressure and hypertension. Philadelphia: Lea and Febiger, 1952, page 144.
40. HALLOCK, P.: Arterial elasticity in man in relation to age as evaluated by the pulse wave velocity method. Arch. Int. Med. 54: 770, 1934.
41. WEZLER, K.: Arterienelastizität, Ztschr. Kreislaufforsch. 27: 721, 1935.
42. HAYNES, F. W., L. B. ELLIS, and S. WEISS: Pulse wave velocity and arterial elasticity in arterial hypertension, arteriosclerosis, and related conditions. Am. Heart J. 11: 385, 1936.
43. EISMAYER, G.: Die Pulswellen-Geschwindigkeit in verschiedenen Gefässgebieten, Ztschr. Ges. Exper. Med. 96: 233, 1931.
44. SIMONSON, E., S. KOFF, and A. KEYS: Contour of the toe pulse, reactive hyperemia, and pulse transmission velocity: Group and repeat variability, effect of age, exercise, and disease. Am. Heart J. 50: 260-279, 1955.
45. COURNAND, A., R. L. RILEY, E. S BREED, F. DE F. BALDWIN and D. W. RICHARDS: Measurement of cardiac output in men using the technique of catheterization of the right auricle or ventricle. J. Clin. Invest. 24: 106-116 1945.
46. BRANDFONBRENER, M., M. LANDOWNE, and N. W. SHOCK: Changes in cardiac output with age. Circulation 12: 557, 1955.
47. LANDOWNE, M., M. BRANDFONBRENER, and N. W. SHOCK: The relation of age to certain measures of performance of the heart and circulation. Circulation 12: 567, 1955.
48. TAYLOR, H. L., W. F. MALONEY, and A. KEYS: Factors affecting the low-frequency, critically-damped ballistocardiogram, with special reference to age, body size, and body composition. Am. Heart J. 48: 864-880, 1954.
49. KETY, S. S.: Changes in cerebral circulation and oxygen consumption which accompany maturation and aging. In "Biochemistry of the Developing Nervous System" (H. Waelsch). New York: Academic Press, Inc., 1955, page 208.
50. SIMONSON, E., and J. BROZEK: Flicker fusion frequency: Background and applications. Physiol. Rev. 32: 349, 1952.
51. OBRIST, W. D.: The electroencephalogram of normal aged adults. Electroencephalog. & Clin. Neurophysiol. 6: 235, 1954.
52. SIMONSON, E., and A. KEYS: The effect of age and body weight on the electrocardiogram of healthy men. Circulation 6: 749-761, 1952.
53. SIMONSON, E., and A. KEYS: Effect of age on spatial mean QRS and T vectors. Circulation 14: 100, 1956.
54. SIMONSON, E.: A spatial vector analyzer for the conventional electrocardiogram. Circulation 7: 403-412, 1953.
55. OLBRICH, O., and E. WOODFORD-WILLIAMS: The effect of change of body position on the precordial electrocardiogram in young and aged subjects. J. Gerontol. 8: 56, 1953.
56. BROZEK, J.: Changes of body composition in man during maturity and their nutritional implications. Fed. Proc. 11: 784-793, 1952.
57. LOBER, P. H.: Pathogenesis of coronary sclerosis. Arch. Path. 55: 357, 1953.
58. SIMONSON, E.: The electrocardiogram in coronary heart disease. Minnesota Medicine 38: 871-873, 1955.
59. HIGGINSON, J., and W. J. PEPLER: Fat intake, serum cholesterol concentration, and arteriosclerosis in the South African Bantu. J. Clin. Invest. 33: 1366, 1954.
60. KEYS, A.: The diet and degenerative heart disease. Proc. 42nd Ann. Meeting Med. Section, Amer. Life Convention, Mackinac Island, Michigan, 163-185, 1954.
61. KEYS, A., and J. T. ANDERSON: The relationship of the diet to the development of atherosclerosis in man Symposium on Atherosclerosis, National Academy of Sciences, Publ. 338: 181-197, 1955.

Age changes in some physiologic processes

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Objective evidence is presented to illustrate the following points about aging: (1) not all physiologic functions change with age, (2) wide individual differences exist in the effects of age, (3) some of the age changes in physiologic functions of the total person can be ascribed to a loss of cellular protoplasm, (4) there is some evidence that cellular functions change with age, and (5) our ultimate goal is to identify the cellular properties that are the basis to the biologic process of aging which is common to all living animals.

◆ In this paper, I want to discuss not patients, but people—aging people. I want to describe some of the things that happen to people as they grow older. Unfortunately, many of our concepts about aging are based on observations made on patients—those in the higher age groups who find their way into physicians' offices or hospitals. Thus, aging has become associated with disease. The studies which I will report were all carried out on aging individuals who were not selected because of their illnesses. We have found that many of the common beliefs about the aged do not hold water when subjected to laboratory studies.

Clinical Material

To illustrate, I will describe briefly the results of some of the studies we have carried out in our laboratories in the Baltimore City Hospitals. First of all, let me describe the kind of people we have studied. Since we are located in a city institution, a great many more men than women request custodial care in our Old Peoples' Home (Infirmary Division of the Baltimore City Hospitals). Therefore, our studies have been made on aging men admitted for custodial care. All admissions are based on economic needs and not on medical incapacities. In fact, to be admitted, the individual must be ambulatory and able to care for his own personal needs. All new admissions are carefully examined by physicians on our staff and any subjects with diagnosable diseases are eliminated from our studies. Although I am not prepared to defend a definition of a "normal" aged person, I can say that the following data have been collected on individuals whose physicians were unable to detect evidence of a disease state referring to the organ system under study.

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The Nature of Physiologic Change

The major biologic fact of aging is that the probability of death increases progressively with age. Since environmental stress can hardly be presumed to increase with age, we conclude that the increasing probability of death must be a reflection of changes taking place within the organism that renders it more susceptible to the stresses of living. What then is the nature of these changes in the individual? Examination of the causes of death makes it clear that certain organ systems are more vulnerable than others. Dr. Himwich has already described age changes in the brain and nervous system. Dr. Simonson has summarized some of the known effects of aging on the cardiovascular system. My aim is to consider age changes that occur in some other physiologic processes.

There are four points that I wish to make. First of all, I want to point out that not all physiologic functions show a decrement with age. Second, I want to illustrate the extremely wide individual differences that exist with respect to age changes in all organ systems. In other words, it is very difficult to predict what an individual's behavior will be with respect to any organ system function simply on the basis of his chronologic age. The third point is that at least some age changes can be explained on the basis of a reduction in the amount of functional tissue—that is, a reduction in the number of functional cells. When we consider the response of a total animal, we are always confronted with this problem: how much of the change observed is caused by the fact that he simply doesn't have as many cells or as many functional units in the organ or organ system under study? Finally, I wish to point out although, as a physiologist, I still have a firm conviction that there must be changes of a physiologic nature that take place within a cell before its disruption, dissolution, and disappearance, evidence

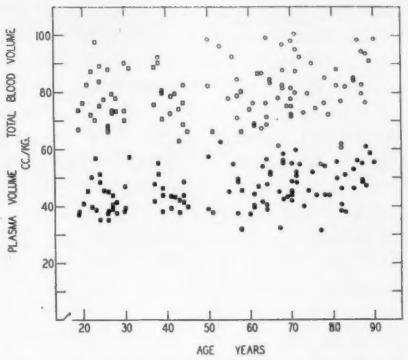

FIG. I. *Total blood volumes, cc. per kilogram and plasma volumes, cc. per kilogram in 105 males.*

□ *total blood volume determinations (Gibson and Evans[2])*

■ *plasma volume (Gibson and Evans[2])*

o *total blood volume (Cohn and Shock[1])*

● *plasma volume (Cohn and Shock[1])*

for such intracellular changes in individual cells is still scanty. I will describe some examples that I think point in this direction, but none of them, in my mind, offers proof positive that we can detect the key changes within a cell that are factors in its dissolution and death.

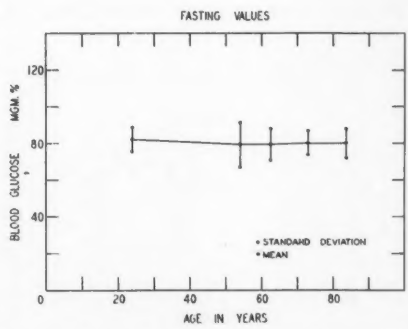

FIG. II. *Average fasting glucose level in arterial blood of males. Vertical line indicates ± 1 standard error of the mean. (From Smith and Shock[3])*

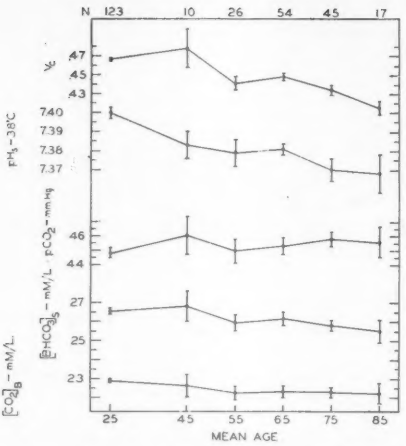

FIG. III. *Trends in the acid-base equilibrium of the blood of males with increasing age. Average curves from top to bottom include per cent red cells, serum pH at 38 C., carbon dioxide tension expressed in millimeters of mercury, serum bicarbonate, and blood carbon dioxide content both expressed in millimoles per liter. The vertical lines indicate ± 1 standard error of the mean. (From Shock and Yiengst[4])*

Functions Not Affected by Age

Let us consider briefly some of the functions which we have studied carefully in the hope of finding age changes that have not been successful. Figure I illustrates the measurements made by Dr. Cohn[1] of the total blood volume in persons ranging in age from 20 to 90.[2] The open circles at the top represent total blood volume in cubic centimeters per kilogram of body weight. The black circles represent plasma volume, also in cubic centimeters per kilogram of body weight. It is evident that the amount of variation is wide and that there is no systematic change over the entire age span.

The fasting arterial blood sugar level, as shown in figure II, is another closely regulated physiologic function.[3] Although individual determinations are not shown, the vertical line indicates the standard deviation of the distribution at each age decade. Thus, the glucose content of the arterial blood under fasting conditions is closely regulated even at advanced ages.

Figure III[4] illustrates results obtained with respect to regulation of the acid-base equilibrium of the blood. Although there is a slight downward trend with age in *p*H and carbon dioxide content, it is small and well within the limits of individual variability. Thus, it is apparent that some physiologic regulations are well maintained under resting conditions in this sample of individuals between the ages of 45 and 85 years.

Functions That Change With Age

On the other hand, some functions do show systematic changes with age. Figure IV shows changes in the plasma flow through the kidney with age.[5] The average curve, drawn as a solid line, shows a gradual decrement between the ages of 30 and 90. Here again the range of individual differences is quite pronounced. For example, one gentleman of 80 has a renal plasma flow which is as good as the average 45-year-old man. Also notice the 80-year-old subject who has a renal plasma flow of only 150 cc. per minute, which was apparently quite adequate for him for there was no evidence of renal impairment or elevation in blood urea nitrogen. We know that if

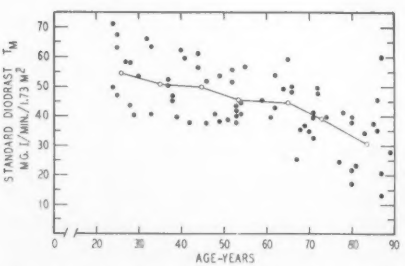

FIG. IV. *Change in standard Diodrast clearance or effective renal plasma flow with age in males. o —— o average values cc. plasma/min./1.73 sq. M. body surface area. (From Shock[5])*

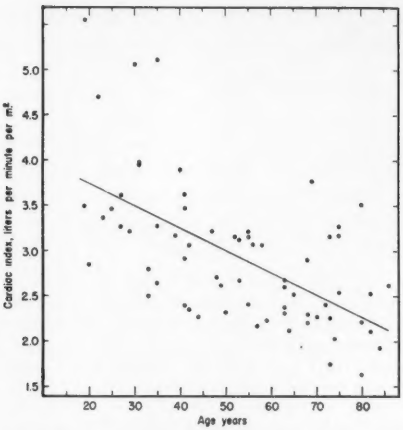

FIG. V. *The relation between basal cardiac index and age in 67 males without circulatory disorder. Each point represents the average of 2 measurements in 49 subjects, of 3 measurements in 4 subjects, and a single measurement in 14 subjects. The line indicates the simple linear regression for the data. (From Brandfonbrener, Landowne, and Shock[6])*

the renal plasma flow dropped to such low levels in a young man, he would show clinical signs of renal impairment and would be very sick. This, I think, illustrates an adaptive process which is one of the characteristics of the elderly.

All of these changes, as far as we can determine from data of this kind, take place progressively and without any noticeable evidence of a sudden alteration at any given chronologic age. What we do not know, of course, is what happens to a single individual as he progresses through his life cycle. The longitudinal type of study is one that we need very badly and which, of course, requires a great deal of time for accumulating data.

With increasing age, there is a gradual reduction in resting cardiac output, as shown in figure V.[6] In the study shown, none of the subjects showed any clinical evidence of cardiac disease. The estimates of cardiac output were made by the dye dilution technic with subjects at rest. Simultaneous recordings of intra-arterial pressure made it possible to calculate the total peripheral resistance against which the heart was working. Figure VI indicates that the total peripheral resistance goes up rather rapidly with increasing age.[7]

Figure VII summarizes the age changes in basal metabolism when calculated in the standard fashion of cals./sq. M./hr.[8] The original data of Boothby, Berkson, and Dunn[9] are higher than subsequent studies and extend only to age 65. Our own observations are represented by the open circles.[10] It is surprising that the line extending between the two open squares, representing data collected in a similar population in a St. Louis home for the aged,[11] agrees so closely with our own results. The only data collected on individuals who were still living in the community are also shown on the chart. This study was made during the 1930's by Dr. Lewis at the Rockefeller Institute.[12] Subjects were brought in from the community and

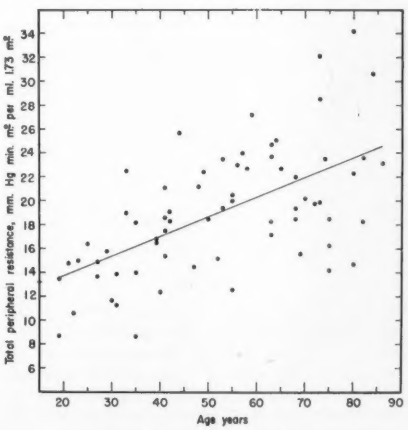

FIG. VI. *Estimated total peripheral resistance of the greater circulation in relation to surface area versus age. Legend same as figure* V. *(From Landowne, Brandfonbrener, and Shock[5])*

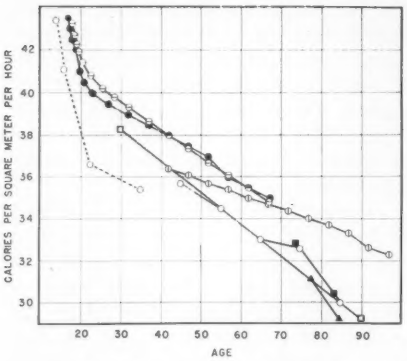

FIG. VII. *Age changes in basal metabolism of males.*

Averages o —— o *(data from University of California adolescent study)*

● —— ● *(data from Boothby, Berkson and Dunn)*

o —— o *(data from Du Bois)*

Ø—Ø *(data from Lewis)*

□—□ *(data from Kountz, Chieffi and Kirk)*

O—O *(data from Shock and Yiengst)*

■—■ *(data from Binet and Bourlière)*

▲—▲ *(data from Matson and Hitchcock)*
(From Shock[8]*)*

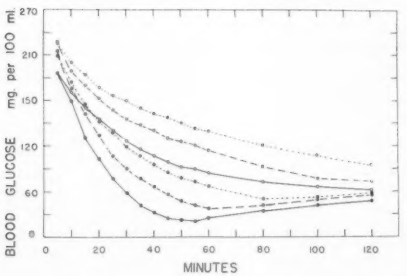

FIG. VIII. *Linear plots of average blood sugar values (mg./100 ml.) at each time interval (min.) following the intravenous administration of 25 gm. glucose for each of 3 age groups. Glucose tolerance (GTT) open circles; glucose plus 5 units insulin per kilogram body weight (GITT) closed circles; old subjects (65 to 87 years old) dotted lines; middle-aged subjects (42 to 58 years old) dashed lines, and young subjects (23 to 37 years old) solid lines. (From Silverstone, Brandfonbrener, Shock, and Yiengst*[13]*)*

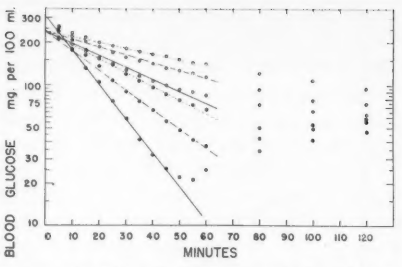

FIG. IX. *Age differences in k_G and k_{GI}. Plots of log glucose concentration in the blood (mg./100 ml.) against time (min.) following intravenous administration of 25 gm. glucose. Glucose tolerance (GTT) open circles; glucose plus 5 units insulin per kilogram body weight (GITT) closed circles; old subjects (65 to 87 years old) dotted lines; middle-aged subjects (42 to 58 years old) dashed lines, and young subjects (23 to 37 years old) solid lines. (Lines are fitted to points for ten to 60 min. inclusive. (From Silverstone, Brandfonbrener, Shock, and Yiengst*[13]*)*

paid to remain in the hospital for two days for a series of tests. The rate of fall in basal metabolism with age was slower in this population than in the institutionalized subjects tested in both St. Louis and Baltimore. I do not know whether this difference has any significance, but I certainly hope that there will be other studies of what I call "free living" populations for comparison.

Age Changes Caused by Stress

Age changes may very often be brought out in an organ system when it is placed under some kind of a stress. I use the word "stress" in a specific sense —that is, the application of a measurable physiologic stimulus with quantitative estimates of the displacements produced and the rate of recovery of equilibrium conditions. One example of a physiologic stress is the glucose tolerance tests which were carried out in a group of old, middle-aged, and young people, with results shown in Figure VIII.[13] These curves with open circles show the average glucose concentration in

venous blood drawn at five-minute intervals following intravenous administration of 50 grams of glucose. The three lower curves, with solid points, illustrate the responses of the same subjects who were given 5 units of insulin with the same amount of glucose. The results show that the rate of disappearance of glucose from the blood is more rapid in the young than the old subjects. Insulin augments the rate of disappearance in all age groups, but, more important, the increase in rate is greater in the young than in the old subjects. These differences in rate can be seen more readily in figure IX, in which straight lines were obtained for the first fifty or sixty minutes of the experiments by plotting log glucose concentrations against time. In other words, young individuals showed a much greater response to insulin than did the old subjects.

Similar physiologic stress tests can be applied to the kidney by estimating the maximum amount of a substance that can be excreted or reabsorbed by the kidney. Figure X illustrates the age decrement in the maximum excretory capacity for Diodrast (T_m Diodrast).[5] Figure XI, shows a similar reduction in the capacity of the kidney to reabsorb glucose.[14] All these renal studies fall off with age at about the same rate, which is about 6 per cent per decade. Apparently, about 6 per cent of the kidney present at the beginning of each decade has been lost during the following ten-year life span.

Age and Diminishing Protoplasm

Anatomic studies by other investigators lend support to the concept that the amount of functioning protoplasm in the kidney diminishes with age. Figure XII, taken from Jean Oliver's review,[15] shows the change in the number of glomeruli present in rat kidneys[16] (solid line) and the weight of the human kidney[17]

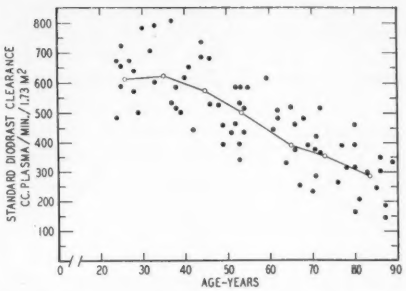

FIG. X. *Change in standard Diodrast T_m with age.*
o —— o *average values mg. Diodrast iodine/ min./1.73 sq. M. body surface area. (From Shock*[5]*)*

(dotted line). These data have been roughly equated in terms of age for the rat and man. Now I wish to point out that, although there is evidence for an age decrement in the number of functioning units in the kidney, our physiologic measures show a greater percentage reduction than the anatomic data. There is a fall of roughly 30 per cent in the number of glomeruli, or renal weights, whereas most of our

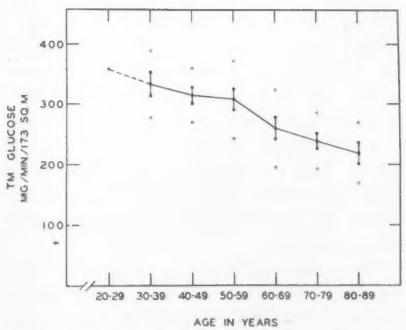

FIG. XI. *Decrease in maximal tubular reabsorptive capacity with age. The slope is drawn to connect the mean values for each decade. The vertical lines represent ± 1 standard error of the mean, while the open circles define the limits of ± 1 standard deviation of the distribution. (From Miller, McDonald, and Shock*[14]*)*

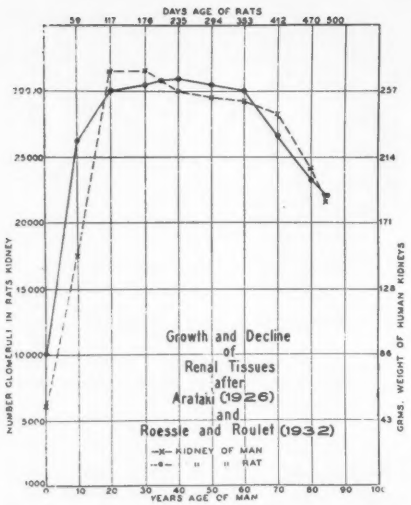
DAYS AGE OF RATS
50 117 176 235 294 353 412 470 500
NUMBER GLOMERULI IN RATS KIDNEY
GRMS. WEIGHT OF HUMAN KIDNEYS
Growth and Decline of Renal Tissues after Arataki (1926) and Roessle and Roulet (1932)
—x— KIDNEY OF MAN
—•— " " RAT
YEARS AGE OF MAN

FIG. XII. *The growth and decline of the renal tissues after Arataki*[16] *and Roessle and Roulet.*[17] *(From Oliver* [15]*)*

physiologic observations have shown decrements of anywhere from 50 to 60 per cent over the life span. This is our first clue that perhaps some changes are occurring within the cells that remain in the aged kidney.

It is obvious that age changes in any physiologic measurement of the total animal may be caused by a reduction in the amount of functioning protoplasm or by a gradual impairment of the metabolic processes of the protoplasm, or by a combination of both. As shown in figure VII, the basal oxygen diminishes with age when surface area is used as an index of the amount of functioning tissue present.

Now let us turn to that concept. Actually, this is not a very good index because the surface area is computed from height and weight, and any fat or water accumulation in the body with increasing age will contribute to the weight. Thus, the surface area will be greater when the amount of functioning tissue may actually be falling off.

However, as Dr. Himwich reported in regard to the brain, the water content of cells does not seem to change with age. Thus, if we can estimate the intracellular water content of the body, we may have an index of the amount of functioning protoplasm present. The total water content of the body may be estimated by following the plasma concentration after intravenous injection of a known amount of antipyrine. The extracellular fluids can be roughly determined by injecting thiocyanate at the same time. Since we have been unable to find evidence for a systematic change in the extracellular phase in the human being with age,[18] we used the total water content, or antipyrine space, of the body as an index of functioning protoplasm. Figure XIII summarizes our results.[8,19] The solid line with open circles represents the change in oxygen uptake per square meter of body surface, resulting in the curve described before. The dotted line with open circles indicates the change in the total water content per unit of surface area. They both go down systematically with age. If we now compute the oxygen uptake per unit of body water, we find that there is no age decrease whatsoever, as shown by the solid line with black circles. Al-

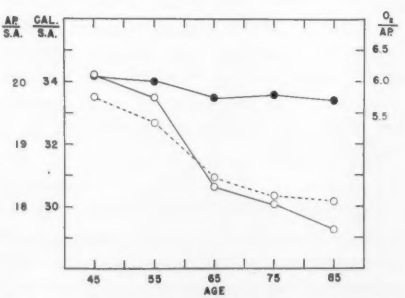

FIG. XIII. *Age changes in basal heat production.*
o ..... o *total body water, liters per sq. M.*
o —— o *basal metabolism, cal./sq. M./hr.*
• —— • *basal oxygen uptake, cc./min./1 total body water. (From Shock*[5]*)*

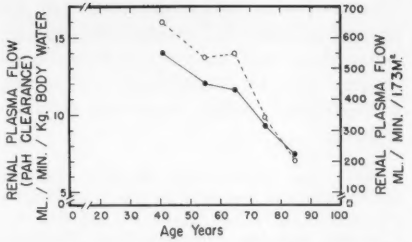

FIG. XIV. *Renal plasma flow (cc./min.) expressed in terms of total body water (antipyrine space). The age decrement in renal function remains. (From Shock[8])*

though I do not regard this as any kind of positive proof, I think it should give us pause before we blithely assume that the metabolism of the cells in the older individual is actually diminishing.

When we utilize measurements of total body water as an index of the amount of functioning tissue present in the individual, the age decrement still remains. As pointed out before, the kidney blood flow, as well as the maximum excretion of Diodrast, went down systematically with age when computed on a surface area basis. We have computed the same data on the basis of body water determinations and figure XIV shows that the age decrement remains. In other words, the rate of loss of functioning tissue in the total body is not paralleled by losses in the kidney.

Reduced Physiologic Responsiveness

Figure XV shows an age change in the physiologic responsiveness of cells remaining in the aged individual. These experiments deal with the response of the renal tubular cells to a physiologic stimulus.[20] A maximum water diuresis was induced in groups of young, middle-aged, and old subjects during the intravenous infusion of inulin. The ratio of the inulin content of the urine to that of plasma is plotted against time. During maximum water diuresis, most of the material filtered at the glomeruli passes on through the tubules and appears in the urine so that the urine-plasma ratio of inulin is relatively low. During maximum water diuresis, there is no age difference in the U/P ratio of inulin. At the end of the third urine-collection period, we administered a very small dose of Pitressin. As shown in figure XV, there was a pronounced rise in the U/P ratio of inulin, indicating a definite increase in water reabsorption by the tubule, and an inhibition of the diuresis. The administered Pitressin serves as a stimulus to the cells lining the renal tubules to increase the rate of transfer of water from the tubules back into the blood.

In the young subjects, the response was prompt and was greater than in the middle-aged, or old subjects. In the old individual, there was still a response, but the extent was considerably less and

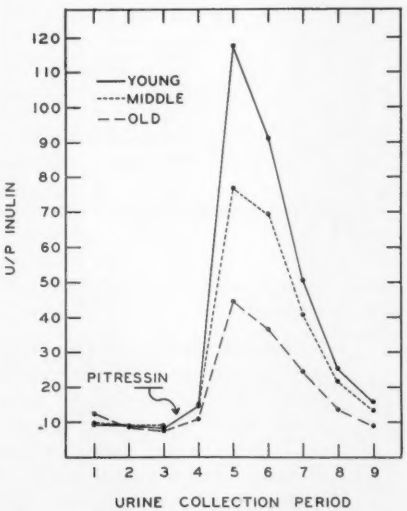

FIG. XV. *Mean values of U/P inulin ratio for each of 3 age groups before and after the intravenous administration of Pitressin. Urine collection periods 1 to 9 represent 9 consecutive twelve-minute periods. Pitressin was administered immediately after the conclusion of period 3. (From Miller and Shock[20])*

the duration somewhat shorter. These experiments indicate that the tubular cells in the old individual show a reduced response to a physiologic stimulus for increased osmotic work. Thus, it is clear that an understanding of the physiologic basis of aging requires additional studies on isolated cells and tissues. We need to apply all of the technics of cellular physiology and biochemistry to old and young animals. Many of our basic questions can be answered only by studies on species other than man, where controlled conditions can be maintained to permit evaluation of changes in cellular metabolism.

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REFERENCES

1. COHN, J. E., and N. W. SHOCK: Blood volume studies in middle-aged and elderly males. Am. J. M. Sc. 217: 388-391, 1949.
2. GIBSON, J. E., II, and W. A. EVANS, JR.: Clinical studies of the blood volume; the relation of plasma and total blood volume to venous pressure, blood velocity rate, physical measurements, age and sex in ninety normal humans. J. Clin. Invest. 16: 317-328, 1937.
3. SMITH, L. E., and N. W. SHOCK: Intravenous glucose tolerance tests in aged males. J. Gerontol. 4: 27-33, 1949.
4. SHOCK, N. W., and M. J. YIENGST: Age changes in the acid-base equilibrium of the blood of males. J. Gerontol. 5: 1-4, 1950.
5. SHOCK, N. W.: Age changes in renal function. Chap. 23, in: A. I. Lansing, editor, Cowdry's Problems of Ageing. Baltimore: Williams & Wilkins Co. Third edition, 1952, pages 614-630.
6. BRANDFONBRENER, M., M. LANDOWNE, and N. W. SHOCK: Changes in cardiac output with age. Circulation 12: 557-566, 1955.
7. LANDOWNE, M., M. BRANDFONBRENER, and N. W. SHOCK: The relation of age to certain measures of performance of the heart and the circulation. Circulation 12: 567-576, 1955.
8. SHOCK, N. W.: Metabolism and age. J. Chron. Dis. 2: 687-703, 1955.
9. BOOTHBY, W. M., J. BERKSON, and H. L. DUNN: Studies of the energy metabolism of normal individuals; a standard for basal metabolism with a nomogram for clinical application. Am. J. Physiol. 116: 468-484, 1936.
10. SHOCK, N. W., and M. J. YIENGST: Age changes in basal respiratory measurements and metabolism in males. J. Gerontol. 10: 31-40, 1955.
11. KOUNTZ, W. B., M. CHIEFFI, and J. E. KIRK: Serum protein-bound iodine and age. J. Gerontol. 4: 132-135, 1949.
12. LEWIS, W. H., JR.: Changes with age in the basal metabolic rate in adult men. Am. J. Physiol. 121: 502-516, 1938.
13. SILVERSTONE, F. A., M. BRANDFONBRENER, N. W. SHOCK, and M. J. YIENGST: Age differences in the intravenous glucose tolerance tests and the response to insulin. J. Clin. Investig.: In press.
14. MILLER, O. H., R. K. MC DONALD, and N. W. SHOCK: Age changes in the maximal rate of renal tubular reabsorption of glucose. J. Gerontol. 7: 196-200, 1952.
15. OLIVER, J. R.: Urinary system. Chap. 24, in: A. I. Lansing, editor, Cowdry's Problems of Ageing. Baltimore: Williams & Wilkins Co. Third edition, 1952, pages 631-650.
16. ARATAKI, M.: On the postnatal growth of the kidney, with special reference to the number and size of the glomeruli (albino rat). Am. J. Anat. 36: 399-436, 1926.
17. ROESSLE, R., and F. ROULET: Mass und Zahl in der Patologie. Berlin and Vienna: J. Springer, 1932.
18. SHOCK, N. W., M. J. YIENGST, and D. M. WATKIN: Age change in body water and its relationship to basal oxygen consumption in males (Abstract). J. Gerontol. 8: 388, 1953.
19. SHOCK, N. W., D. M. WATKIN, and M. J. YIENGST: Age changes in renal function and basal oxygen consumption as related to total body water. (Abstract.) Baltimore: Fed. Proc. 13: 136, 1954.
20. MILLER, J. H., and N. W. SHOCK: Age differences in the renal tubular response to antidiuretic hormone. J. Gerontol. 8: 446-450, 1953.

To the concept that we cannot reach emotional maturity without relinquishing the egocentric demands of childhood, we must add the statement that it is also necessary to repudiate the demands for power over others which also belong to immaturity. The child says, "Play with me," "Read to me," "Stay with me." The sick person may make similar demands. And the aged person repeats them if, like a child, he feels inadequate to meet each day on the basis of his own strength.

ETHEL SABIN SMITH: *The Dynamics of Aging*

Postural dizziness in the aged

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Postural dizziness is the typical form of dizziness in the aged. Its etiology was studied by comparing a group of postural dizziness patients with a control group without dizziness. It was ascertained that cerebral neurologic symptoms, headache, tinnitus, cardiac failure, high blood sugar values, and positional nystagmus were significantly more frequent in the postural dizziness group. No other difference was shown between the groups in any aspect of internal medicine, neurology, otology, or ophthalmology.

◆ Dizziness is very common in old people.[1, 2] In our patients in the geriatric outpatient department, Research Center for the Aged, Helsinki, dizziness occurred in 81 per cent of the men and in 91 per cent of the women over 65.

The labyrinth, eyes, and kinesthetic sensations from the joints and muscles control equilibrium and position. A sensation of disturbed equilibrium may arise from disturbed function of the sensory receptors, impaired conduction from the receptors to the central nervous system, dysfunction of cerebral centers and their interconnections involved in the control of equilibrium, or impaired function of some cortical mechanisms. Thus the causes of dizziness and the site and type of the causative lesions may vary considerably. The purpose of this study is to investigate the symptomatology and the etiology of dizziness in old people.

Material and Methods

The information used in this study was obtained from three different sources: (1) group of people with dizziness, (2) questionnaire series, and (3) control group.

GROUP 1. PEOPLE WITH DIZZINESS

We announced in Helsinki's largest newspapers that a study of dizziness in old people was being made at the geriatric outpatient department and asked people over 64 to report for an examination. Although no selection was made in regard to the patients taken for examination, it is clear that the group is not a random sample of the aged population suffering from dizziness. Obviously its social and economic status and intelligence level are above average, and more severe forms of dizziness appear in it more than would be the case in a random sample. Nevertheless, this type of bias is considered desirable.

There were 112 persons in this group, 76 women and 36 men. All were examined in the same way. Examination included physical examination; neurologic, otorhinolaryngologic, and ophthalmologic examinations; chest roentgenograms and further roentgenograms as indicated; and laboratory tests. In addition to the usual history and what the patient told about his dizziness, we tried to get as precise information about the dizziness as possible: quality, manner of appear-

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ance, beginning, other symptoms possibly connected with it, poisonings, use of medicines, and so on. Since all patients were from Helsinki, it was possible in many cases to verify their accounts from the case histories in hospitals and outpatient departments. All the patients in this group were examined for the first time in the autumn of 1953, and, when necessary, it was possible to follow the patients and examine them further for a year and a half.

GROUP II. QUESTIONNAIRE SERIES

A questionnaire regarding presence of dizziness and certain other matters was sent to 1,085 randomly chosen patients who had visited the geriatric outpatient department during the preceding two years. In the form were several questions answerable in a consistent manner, either yes or no. In addition, the patient was requested to describe his dizziness; its quality, duration, and manner of appearance; his dizziness attacks; paralyses; and ear diseases. These requests were naturally complied with in an inconsistent manner—some answered at length, some briefly, and different persons attached greatest importance to different matters. Thus the answers to these last mentioned questions did not give accurate information, but did show a tendency.

A total of 1,085 forms were sent out, and 811 were returned which were suitable for use.

GROUP III. CONTROL

The 121 patients who reported no dizziness in the questionnaire were invited to come in for an examination. By the time the invitation was sent, 2 had died; 28 could not come in; and, in the first examination, it was found that 29 had, or formerly had, dizziness. Thus they were not included among the controls, leaving a group of 62 patients, 44 women and 18 men. This group was examined in exactly the same way as the first group with dizziness.

Symptomatology

In the literature, the words *dizziness* and *vertigo* have been used to describe different types of dizziness by limiting *vertigo* to a turning sensation. This usage, however, does not seem to have become established.

In this study, *dizziness* is used as a general name for all disorders of equilibrium, including all subjective sensations of disturbed equilibrium.

When the type of dizziness is described, we use the term *vertigo* if the equilibrium disturbance is accompanied by the sensation of a turning motion and as a contrast we use the term *dizziness without turning sensation* for all other equilibrium disturbances. *Dizziness attack* means an equilibrium disturbance, which comes suddenly in the form of an attack, so severe that the patient is unable to stand up or is able to move only with continuous support. It lasts at least for several minutes and after a time abates or disappears. For dizziness which appears in connection with a movement of the body or head, with a change of position, or in definite positions, but not while otherwise remaining still, we use the term *postural dizziness*.

The dizziness of the first group and that of the questionnaire series have been grouped according to these principles. From the questionnaire series, we used only the 690 in which a completely positive answer was given to the question concerning the presence of dizziness. The 29 patients who did not report dizziness but on examination were found to have dizziness, have been taken into consideration only when computing the general frequency of dizziness.

In the majority—92 per cent in group I (dizziness group) to 95 per cent in group II (questionnaire series)—dizziness was of the postural dizziness type. Thus, this type of dizziness which occurs in movements or definite positions may be considered a typical form of dizziness in the aged and only this form of dizziness

will be discussed. Other forms – attacks and continuous dizziness—which also appeared in patients in the postural dizziness group, will be discussed in the second paper of the study.[3]

Postural dizziness is generally unaccompanied by turning sensation. Vertigo appeared in about one-third of patients—35 per cent of the postural dizziness group and 43 per cent of the questionnaire series. Even in those who had vertigo, dizziness without turning sensation was more common. In the dizziness group, there were only 6 patients whose postural dizziness was solely of the vertigo type. It was impossible to obtain such exact information from the questionnaire series.

In most, dizziness generally appeared in the same way. In a few, the type varied or one person had two or three of the types listed in table 1, none of which, in the patient's opinion, was dominant. Since these types have all been included in the list, their sum is greater than the number of patients.

The patients' sensations are not always such that they can be considered equilibrium disturbances in an objective sense. However, a feeling of disturbed equilibrium maintenance is subjectively associated with these sensations and should be considered as dizziness, although the subjective sensation is not as clear as in strong turning vertigo. In McNally and Stuart's study, many patients had this type of dizziness with no sensation of a turning motion in connection with caloric tests;[4] in the caloric test, it is really a question of disturbance in the mechanism which maintains equilibrium. Torok[5] and Langer and Schober[6] also ascertained that subjective sensations are not directly correlated with objective vestibular reactions.

Postural dizziness usually lasts for just a moment (table 1). Even those who have dizziness of longer duration also have, and perhaps much more often, the momentary form. Dizziness of longer duration seems to appear in quite definite positions or after definite motions. The vertigo type also seems to be of longer duration.

Table 1 also shows for each patient two or three positions or motions in which dizziness appeared. It should be observed that a movement and not a position is generally the provoking factor. A position, lying on one side, was the provoking factor in only a few patients. The dizziness-provoking influence of situations which increase heart work is noteworthy.

Although dizziness does not usually cause its victims to fall, it had caused a full third of the patients to fall at least once, and a few patients fell at least once a week because of dizziness. Most of those in the questionnaire series gave no answers by which the severity could be determined. In the majority dizziness appeared every day or several times a week.

When questioned regarding how long dizziness had occurred, 21 patients of group I reported under one year; 28, under three years; 21, under five years; 19, under ten years; 12, under twenty years; and 2, over twenty years. The questionnaire series gave no usable information in the respect either. The length of time during which patients had suffered from dizziness had no correlation with age, although the patients who had had dizziness the longest were in the older part of the group.

Etiology

The etiology of postural dizziness was studied by comparing the postural dizziness group with the nondizziness control group. Information obtained from the questionnaire series was also utilized.

Among the patients of the geriatric outpatient department, 91 per cent of the women and 81 per cent of the men suffered from dizziness which in 95 per cent was of the postural dizziness type. Thus, to a certain extent, it is more common in women. The same observation

TABLE 1

SYMPTOMATOLOGY OF POSTURAL DIZZINESS

	Group I Number of patients	*Group II Number of patients*
Quality of dizziness without turning sensation		
Momentary equilibrium disturbance	47	57
Blackout or spots before the eyes	42	45
Staggering, loss of balance	20	64
Accompanied by nausea	16	15
Feeling of falling	14	76
Heaviness or confusion in the head	7	46
Fainting	7	9
Buzzing in the ears	1	5
No answer		173
Duration of dizziness		
A moment or a few seconds	58	272
A few seconds to one minute	24	19
One to five minutes	9	17
Over five minutes	12	59
No answer		252
Movements eliciting postural dizziness		
All sudden movements of the head or whole body	65	47
While walking	58	317
Rising from bed or from sitting position	52	319
Lying down	21	61
Looking upward	13	28
Bending forward	12	50
Definite position in bed	11	4
Looking downward	9	31
Turning on the side in bed	9	9
Lying in bed	8	55
Standing	4	17
Starting to walk	3	7
No answer		60
Other factors producing dizziness		
Physical exertion	27	43
In connection with angina pectoris	8	7
In connection with dyspnea	3	
More after eating	8	
More when fasting	4	

was made by Sheldon[1] and Droller and Pemberton.[2]

Age distribution of the postural dizziness and nondizziness patients in the questionnaire series is shown in figure I. There was no difference between the groups in this respect.

CLINICAL ASPECTS

In evaluating the usual physical and laboratory findings, conventional criteria were used (tables 2 and 3). The blood pressure values were those obtained from each patient in the first measurement, which was taken after the patient had been sitting and talking with the examining doctor for about half an hour. The mean pressure is $\frac{\text{systolic pressure} + \text{diastolic pressure}}{2}$

All of the fasting blood sugar values of $\geq$ 140 milligrams per cent were controlled by a second measurement, and

TABLE 2

COMPARISON OF CLINICAL FINDINGS

	Postural dizziness group (103 patients) No. of patients	*Nondizziness group (62 patients) No. of patients*	
Cardiac enlargement	73	33	none†
Pulmonary stasis	55	19	$P < 0.005$
Peripheral stasis	37	16	none
Angina pectoris	17	17	none
Intermittent claudication	3	0	none
Systolic pressure ≥170	77	42	none
Systolic pressure ≥190	57	25	none
Diastolic pressure ≥100	64	32	none
Diastolic pressure ≥110	39	18	none
Diabetes mellitus*	14	4	none
Blood sugar ≥140*	12	1	$P < 0.02$
Blood sugar ≥160*	11	0	$P < 0.01$
Chronic nephritis	3	1	none
Urinary infection	24	14	none

*A blood test was taken from only 101 patients of the postural dizziness group and 58 patients of the nondizziness control group.

†The expression "none" indicates that the probability (P) of obtaining the observed set of frequencies is larger than 0.1, the difference between groups then being clearly insignificant.

cases in which the blood sugar was considered to be ≥ 140 milligrams per cent were those in which such a result was found in at least two different measurements.

With respect to clinical findings, the groups differed only in the occurrence of heart failure and high blood sugar values.

NEUROLOGIC ASPECTS

All patients were given a neurologic examination, but a complete sensibility examination, liquor examination, and electroencephalographic study only as indicated. Abnormality as shown in the electroencephalogram alone was not considered a pathologic finding. It was possible

TABLE 3

COMPARISON OF MEASURABLE DATA

	Postural dizziness group (103 patients)		*Nondizziness group (62 patients)*				
	Median	*S.E.M.†*	*Median*	*S.E.M.†*	*f*	*t*	*P*
Systolic pressure	194	4.8	184	4.6	163	1.52	>0.1
Diastolic pressure	104	2.3	99	2.2	163	1.56	>0.1
Mean pressure	148	3.5	142	3.2	163	1.28	>0.1
Blood sugar*	92.0	2.12	92.2	2.07	157	0.07	>0.1
Hemoglobin*	13.7	0.18	14.1	0.21	157	1.43	>0.1
Erythrocyte sedimentation rate (women)*	21	2.5	17	2.6	111	1.1	>0.1
Erythrocyte sedimentation rate (men)*	15	3	15	3	44	0	>0.1

*See first footnote table 2. †S.E.M.—Standard error of the median.

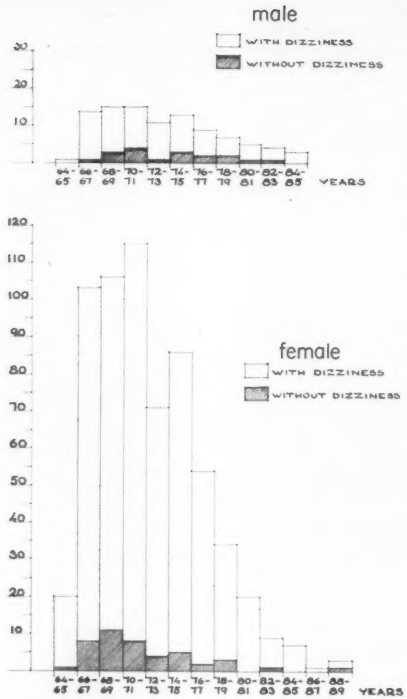

FIG. 1. *Age distribution of postural dizziness and nondizziness patients in the questionnaire series.*

to follow all patients closely for about four months. Neurologic attacks occurring in the patients during this time were included.

Neurologic attacks mean attacks with neurologic symptoms—that is, motor or sensory paralysis. Unconsciousness was also considered as a neurologic symptom if no other cause for it could be determined. When the case histories of all such patients who had been cared for by outpatient departments or hospitals were examined, it was found that a few patients had had neurologic symptoms even though they did not mention them in their anamneses. The opposite—that anamnestic neurologic symptoms were not confirmed by the case histories—did not occur. The attacks discussed in the second part of this study[3] as "probable neurologic attacks" were not listed as neurologic attacks, although we have come to the conclusion that most of them were.

Focal cerebral signs include paralyses, sensory disturbances, reflex anomalies, visual field changes, and so on—symptoms which clearly point to a local cerebral lesion. Such neurologic symptoms whose obvious cause lies in the peripheral nerves or spinal cord—for example, cases of tabes dorsalis and subacute combined sclerosis—were not included in this group.

Diffuse cerebral signs are those symptoms which are more difficult to localize and whose obvious cause is in the cerebellum or basal ganglia. These include rigidity, tremor, ataxia, and incoordination.

Mental symptoms are those psychic symptoms which are generally, possibly to some extent erroneously,[7] combined with old age or cerebral arteriosclerosis. These include memory defect, especially for recent events; periods of emotional sensitivity; attacks of confusion; periodic irritability; and nocturnal attacks of restlessness and confusion. In this respect, the examination was not completely competent because it was not possible to carry out a real psychiatric examination. The patient's memory was tested by asking him about his life history, what he thought of the condition of his memory, and what he remembered from his previous visit. The mental state was observed in repeated examinations, and information about attacks of confusion, restlessness, and the patient's "difficulty" was obtained from relatives. Some suggestion of the patient's intellectual ability was obtained by observing him in rather difficult examinations, such as the audiometry and Amsler chart examination.

Comparison of neurologic findings showed that the postural dizziness and nondizziness control groups differed very

TABLE 4

COMPARISON OF NEUROLOGIC ANAMNESIS AND FINDINGS

	Postural dizziness group (103 patients) No. of patients	*Nondizziness group (62 patients) No. of patients*	*Significance of difference*
Neurologic attack	24	0	$P < 0.001$
Focal cerebral signs	26	2	$P < 0.001$
Diffuse cerebral signs	46	7	$P < 0.001$
Mental symptoms	44	5	$P < 0.001$
Headache	67	16	$P < 0.001$

significantly, as shown in table 4. Cerebral arteriosclerosis is quite obviously a cause of neurologic attacks and focal symptoms, as will be discussed in the second part of this paper.[3] On the other hand, diffuse symptoms may also be caused by other degenerative damage, and emotional and situational factors may contribute to the etiology of mental symptoms. In any case, results of the neurologic examination may be interpreted to show that cerebral arteriosclerosis is very common in the postural dizziness group, rare in the nondizziness group, and the difference between the groups is very significant in this respect.

Of the 690 in the questionnaire series who reported having dizziness, 92 had had some kind of paralysis. On the other hand, none of the 121 who stated that they have no dizziness had had paralysis. According to the reported symptoms, the case histories of the hospitals, and the diagnoses of the attending physicians, 53 of the 92 reported cases of paralysis were some type of apoplectic strokes; 10 attacks were surely something else, such as cardiac arrythmia, Bell's palsy, or sunstroke; and there was not enough information about 29 cases to indicate the nature of the paralysis.

Headache was significantly more prevalent in the postural dizziness group and also more severe than in patients of the nondizziness group. Headache was most often localized in the forehead, than in the whole head and neck.

OTORHINOLARYNGOLOGIC ASPECTS

The examination included auroscopy, a test of ear-drum mobility with a Brunnings-Siegle chamber, anterior and posterior rhinoscopy, and laryngoscopy. Hearing was tested with an audiometer at 120, 1,000, 2,000, 4,000, and 8,000 cycles per second. Only patients who had no ear disease, with the exception of presbycusis, were included in the comparison. A caloric test was done with air, but if no reaction was obtained, the test was made with water, with 20 cc. at 20° applied directly to the ear-drum, the injection lasting about five seconds. No quantitative results were sought in the caloric test, but only a qualitative determination of the reaction of the vestibular organs to a caloric stimulant.

It was not possible to show any divergence between the groups in regard to otorhinologic findings, although there was a significant difference in occurrence of tinnitus, as shown in table 5. In the dizziness group, tinnitus was more common, more severe, and gave more trouble to the patient. In most patients, tinnitus took the form of whistling, buzzing, or ringing in the ears. Only a few patients had pulsating sounds in the ears or sounds in the head. No difference appeared in hearing acuity.

POSITIONAL NYSTAGMUS

Nystagmus was examined in the following positions: sitting position, leaning to

TABLE 5

COMPARISON OF OTOLOGIC FINDINGS

	Postural dizziness group (103 patients) No. of patients	*Nondizziness group (62 patients) No. of patients*	*Significance of difference*
Some disease in the middle ear	42	21	None
Chronic otitis media without suppuration	4	0	None
Chronic otitis media with suppuration	2	0	None
Status post otitis media (no perforation)	21	15	None
Chronic eustachian catarrh or adhesive process	15	6	None
Wax in the ear	9	10	None
Maxillary sinusitis	6	3	None
Tinnitus	74	22	$P < 0.001$

left and right, bent forward, lying on the back, lying on the back with head hanging, lying on the right side and left side, and rising from a supine position. The nystagmus which was found was grouped as follows:

Type 1. Positional nystagmus which changes direction. Thus, in different positions, nystagmus has different directions, corresponding to Seiferth's[8] and Lindsay's[9] "a direction changing positional nystagmus" and Nylén's type 1.[10]

Type 2. Direction-fixed positional nystagmus. The nystagmus has the same direction in all positions in which it occurs or it occurs in only one position, corresponding to Seiferth's[8] and Lindsay's[9] "a direction-fixed positional nystagmus" and Nylén's type 2.[10]

Type 3. Indefinite positional nystagmus. By this is meant indefinite nystagmus of short duration—ten seconds or less.

The appearance of positional nystagmus is significantly greater in the postural dizziness group, as shown in table 6.

TABLE 6

POSITIONAL NYSTAGMUS

	Postural dizziness group Number of patients	*Nondizziness group Number of patients*	*Significance of difference*
Type 1	5	0	
Type 2	19	5	
Type 3	7	3	
Total	31	8	$P < 0.025$

OPHTHALMOLOGIC ASPECTS

Refraction was determined by the subjective method of trying glasses and, when necessary, by skiascopy. The anterior parts of the eye were examined with a biomicroscope. All patients were examined with a tonometer, glaucoma provocation tests were made, and visual fields were examined as indicated. Funduscopy was carried out on all patients. Changes in the blood vessels of the retina were graded according to Scheie (table 7).[11]

The groups do not differ from each other in any examined ophthalmologic feature. In funduscopy, the changes typical of essential hypertension were found in only two patients. In most patients there were discernible changes which are generally considered to be caused by "sclerosis." This grouping offered by Scheie[11] was considered most suitable for the gradation of these "sclerotic" changes.

Conclusions and Discussion

Postural dizziness coming from sudden movements of the head or whole body proved the most common form, affecting 92 to 95 per cent of the patients suffering from dizziness. Thus it may be considered a typical form of dizziness in the aged. Postural dizziness may result from any sudden movement, but some people have it only in certain movements, such as

TABLE 7

COMPARISON OF OPHTHALMOLOGIC FINDINGS

	Postural dizziness group (93 patients) Number of patients	*Nondizziness group (62 patients) Number of patients*	*Significance of difference*
Blood vessel findings			
Gradus 0	7	6	None
Gradus 1	37	24	None
Gradus 2-4	33	16	None
Lacking	26	16	None
Dense lens opacity	4	6	None
Anisometropia >0.50 D	17	17	None
Glaucoma	7	1	None

walking or rising from bed. Only a few patients in our study had "positional vertigo," a dizziness which comes in a certain position. In most patients, dizziness lasted only a moment or a few seconds. In the majority it was a type of dizziness without turning sensation, but about one-third also experienced vertigo, a turning sensation. A full third of the patients had fallen because of dizziness.

Tinnitus; buzzing; murmuring in the ears; in rare instances, noises in the head; and headache, usually in the forehead, proved to be common symptoms in old people suffering from dizziness.

A random questioning of geriatric ambulatory patients showed that dizziness is somewhat more common in women than in men. In respect to age, the postural dizziness and nondizziness groups did not differ from each other.

The etiology of postural dizziness of the aged was studied by comparing the group of patients suffering from it with a nondizziness control group. The postural dizziness group had significantly more cerebral symptoms, obviously caused by arteriosclerosis, which were demonstrated by anamnesis and by findings. From the questionnaire series, it was also found that of 690 patients who had dizziness, at least 53 had had some kind of apoplexy. None of the 121 who stated they were free of dizziness had had any kind of stroke. Postural dizziness began in 13 patients with a clear neurologic attack and in 7 with a probable neurologic attack. These observations lend support to the idea that postural dizziness in the aged has a central etiology.

Although there was no difference between the groups in the mean values of fasting blood sugar, there were more high blood sugar values in the postural dizziness group. Of the 14 cases of diabetes in the postural dizziness group, the disease had been ascertained earlier in only 4. In the nondizziness group, the 4 cases of diabetes had been discovered earlier and all four were under proper care. It is very possible that the undiscovered and uncontrolled diabetes had a detrimental effect on the blood vessels of those patients. However, it was impossible in this study to confirm this statistically by comparing the occurrence of neurologic symptoms and diabetes. It has been shown that occlusions of the small nutrient arteries of the brain occur only in connection with hypertension or diabetes.[12] The *état lacunaire* arising from this most often occurs in the basal ganglia and pons and may be in the form of lesions causing dizziness.

Heart failure occurred in the postural dizziness group significantly more often than in the nondizziness control group. Such factors as exertion and eating, which tend to aggravate symptoms of heart failure, provoke dizziness in many patients. Heart failure may impair the defective cerebral blood circulation of persons with cerebral arteriosclerosis and thus cause symptoms. Corday and his associates found hemiplegia in connection with heart failure and believe that its cause is either a drop in blood pressure or stagnant anoxia.[13] The thrombotic occlusion of small veins of the cerebral cortex, in the absence of vascular occlu-

sions of large cerebral blood vessels, has been found in connection with heart failure.[14] These small occlusions may cause cerebellar symptoms. Some observers believe that cerebral blood flow decreases in heart failure,[15, 16] but others have not observed any decrease.[17, 18]

It may seem surprising that the groups did not differ in respect to blood pressure, for many persons believe that dizziness in the aged is caused by high blood pressure. This accords with some earlier investigations in which no correlation was found between occurrence of dizziness and hypertension nor between that of dizziness and blood pressure level.[19-21] Dizziness in connection with hypertension has been considered as a psychoneurotic[22] or psychosomatic symptom,[23, 24] and the barbiturates which are much used in the treatment of hypertension have also been blamed.[25] It is improbable that our groups would differ in this respect.

In funduscopy, we found mainly "sclerotic" changes in the blood vessels and not those typical of essential hypertension. For this reason, Scheie's gradation[11] was used. Although the groups differ significantly regarding symptoms of cerebral arteriosclerosis, it was impossible to show a difference in respect to "sclerotic" retinal changes.

Positional nystagmus occurred significantly more in the postural dizziness group than in the nondizziness group. Langer and Schober believe that positional nystagmus is a sensitive indicator of various vascular function disturbances in the brain, and is often the only objective finding in patients complaining of dizziness.[6] In general, positional nystagmus is regarded as a pathologic finding.[6, 10, 26]

The direction changing type is generally considered to indicate a central lesion, and the fixed direction type a central or peripheral lesion.[8-10, 27] The results of a more detailed study indicate that the positional nystagmus of these cases had a central etiology.[28]

Many authors have proposed cerebral arteriosclerosis as a cause of postural dizziness in the aged.[29-33] Others believe the cause is disturbance in the inner ear,[34, 2] disease in the cervical region,[35] or a psychogenic factor.[36]

A significant correlation was found between occurrence of dizziness and symptoms of cerebral arteriosclerosis. Since the blood circulation of the inner ear is also a part of the cerebral blood circulation, it does not necessarily follow that the causative disturbances would be localized in the brain, although many things do so indicate. If the cause were a disturbance of the blood circulation or a degenerative change in the inner ear, we would expect a difference between the groups in the auditory function on the inner ear. However, such a difference was not observed. In addition, this dizziness began in 13 patients following a certain neurologic attack, and in 7 others after a probable attack. In these, the localization of the damage is in the brain. Support for a central etiology is also obtained from the clinicopathologic study of von Fieandt and Saxén, who ascertained that the changes appearing in old age in the static labyrinth are quite small, and cannot be the cause of anomalous vestibular reflex. If such appears, its cause is central.[37]

We have not actually studied the mechanisms which cause dizziness in persons with cerebral arteriosclerosis. Since dizziness comes from a change of position, it is most probable that some kind of transient circulatory disturbances is in question. In one way or another, the cerebral blood circulation of these patients does not adapt itself quickly enough to the new situation created by a movement or new position.

From the Research Center for the Aged, Outpatient Department, Societas Gerontologica Fennica. We are indebted to Kaarina Koskinen, M.D., for her assistance in ophthalmologic ex-

amination, and to E. O. T. Hulmar, M.D., whofrom Societas Gerontologica Fennica, Helsinki. carried out electroencephalographic examina- The second paper reporting findings of this tions. The statistical analysis was made by Sta-study, "Dizziness Attacks and Continued Dizzi-tistical Section,Institute of Occupational Health,ness in the Aged," will follow in the February Helsinki. This study was supported by fundsissue.

REFERENCES

1. SHELDON, J. H.: The social medicine of old age. London: Oxford University Press, 1948.
2. DROLLER, H., and J. PEMBERTON: Vertigo in a random sample of elderly people living in their homes. J. Laryng. & Otol. 67: 689-694, 1953.
3. ORMA, E. J., and M. KOSKENOJA: Dizziness attacks and continuous dizziness. Geriatrics: To appear in the February issue.
4. MC NALLY, W. J., and E. A. STUART: Quoted by McNally, W. J.: The physiology of the vestibular mechanism in relation to vertigo. Ann. Otol. Rhin. & Laryng. 56: 514-533, 1947.
5. TOROK, N.: Neglected factors in the evaluation of dizziness. Eye, Ear, Nose & Throat Month. 31: 147-150, 1952.
6. LANGER, R., and W. SCHOBER: Die Bedeutung des Lagenystagmus für die Beurteilung vaskularer Funktionsstörungen des Gehirnes. Monatsschr. Ohrenh. 86: 209-213, 1952.
7. MC LEAN, A. A.: Cerebral arteriosclerosis; a comparison of clinical status with autopsy findings. Northwest M. 52: 374-376, 1953.
8. SEIFERTH, L. B.: Die Bedeutung des Lagenystagmus für die otologische und neurologische Diagnostik. Arch. Ohren, Nasen, u. Kehlkopf. Heilk. 143: 52-74, 1937.
9. LINDSAY, J. R.: Postural vertigo and positional nystagmus. Ann. Otol. Rhin. & Laryng. 60: 1134-1149, 1951.
10. NYLEN, C. O.: Positional nystagmus; a review and future prospects. J. Laryng. & Otol. 64: 295-318, 1950.
11. SCHEIE, H. G.: Evaluation of ophthalmoscopic changes of hypertension and arteriolar sclerosis. Arch. Ophth. 49: 117-138, 1953.
12. ADAMS, R. D., and H. M. VANDER EECKEN: Vascular diseases of the brain. Ann. Rev. Med. 4: 213-252, 1953.
13. CODAY, E., S. F. ROTHENBERG, and T. J. PUTNAM: Cerebral vascular insufficiency; an explanation of some types of localized cerebral encephalopathy. Arch. Neurol. & Psychiat. 69: 551-570, 1953.
14. SCHEINKER, J. M.: Cerebral vasothrombosis in cardiac diseases; clinicopathologic study. Ann. Int. M. 42: 128-135, 1955.
15. SCHEINBERG, P.: Cerebral circulation in heart failure. Am. J. Med. 8: 148-152, 1950.
16. STEAD, E. A., JR., J. D. MYERS, P. SCHEINBERG, W. H. CARGILL, J. B. HICKAM, and B. A. LEVITAN: Studies of cardiac output and of blood flow and metabolism of splanchnic area, brain, and kidney. Tr. A. Am. Physicians 63: 241-245, 1950.
17. NOVACK, P., B. GOLUBOFF, L. BORTIN, A. SOFFE, and H. A. SHENKIN: Studies of the cerebral circulation and metabolism in congestive heart failure. Circulation. 7: 724-731, 1953.
18. MOYER, J. H., S. I. MILLER, and H. SNYDER: Cerebral hemodynamics in patients with heart failure associated with hypertension and response to treatment. J. Clin. Invest. 34: 121-125, 1955.
19. FURSTENBERG, A. C.: Summation; symposium on vertigo. Ann. Otol. Rhin. & Laryng. 56: 576-582, 1947.
20. JOHNSON, L. F., and B. ZONDERMAN: The hearing acuity, tinnitus, and vertigo in essential hypertension. Laryngoscope 58: 374-379, 1948.
21. DROLLER, H., J. PEMBERTON, C. ROSEMAN, and J. L. A. GROUT: High blood pressure in the elderly. Brit. M. J. 2: 968-970, 1952.
22. DAVIS, D.: The nature of symptoms in essential hypertension. Am. J. M. Sc. 181: 850-856, 1931.
23. WOLF, G. A., JR., and H. G. WOLFF: Studies on nature of certain symptoms associated with cardiovascular disorders. Psychosom. Med. 8: 293-319, 1946.
24. WEISS, E., and O. S. ENGLISH: Psychosomatic Medicine. Second edition. Philadelphia: W. B. Saunders Co., 1949.
25. LEWY, A.: The symptomatology of vertigo. Ann. Otol. Rhin. & Laryng. 56: 534-540, 1947.
26. FLETCHER, R.: The finding of positional nystagmus in the dizzy patients. Laryngoscope 60: 532-542, 1950.
27. CAWTHORNE, T.: Positional nystagmus. Ann. Otol. Rhin. & Laryng. 63: 481-490, 1954.
28. KOSKENOJA, M., and E. J. ORMA: Positional nystagmus in elderly patients with postural dizziness. Ann. Otol. Rhin. & Laryng.: In press.
29. FREMEL, F.: Das Schwindelgefühl. Wien. med. Wchnschr. 91: 557-559, 1941.
30. ELIASER, M., JR.: Vertigo and related conditions; a new therapeutic concept. J. Lab. & Clin. Med. 29: 680-683, 1944.
31. LINDSAY, J. R.: Pathology of vertigo arising from the peripheral vestibular apparatus. Ann. Otol. Rhin. & Laryng. 56: 541-556, 1947.
32. LEWIS, M. L.: The problem of the dizzy patient. New Orleans M. & S. J. 104: 161-163, 1951-52.
33. RONIS, B. J.: Vertigo in geriatrics. Eye, Ear, Nose & Throat Month. 31: 361-364, 1952.
34. SIMONTON, K. M.: The symptom of dizziness; its significance in general practice. Proc. Staff Meet., Mayo Clin. 16: 465-470, 1941.
35. DAVIS, D.: A common type of vertigo relieved by traction of the cervical spine. Ann. Int. M. 38: 778-786, 1953.
36. FORD, F. R.: A clinical classification of vestibular disorders with differentiation of three syndromes and discussion of a common form of vertigo induced by sudden movement of the head. Bull. Johns Hopkins Hosp. 87: 299-304, 1950.
37. VON FIEANT, H., and A. SAXEN: Pathologie und Klinik der Altersschwerhörigkeit. Acta oto-laryng. Suppl. 23, 1937.

QUERIES AND THERAPEUTIC NOTES

Practical treatment of hypothyroidism in the elderly patient

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Q. What causes hypothyroidism in elderly people?

A. Several causes are known.

1. Previous Basedow's (Graves') disease, either after thyroidectomy or less commonly after certain cases not operated upon, in which the disease seems to have "burned itself out"—that is, the overactive state of the thyroid gland has been replaced by diminished and inadequate activity.

2. After operation for simple or adenomatous goiter, when an insufficient amount of thyroid tissue remains or after excessive treatment as by x-ray or radioactive iodine.

3. After total ablation of the thyroid gland performed in certain cases to correct overactivity of the heart. This procedure is not now as frequent as formerly.

4. Occasionally overtreatment of thyrotoxicosis with the thyourea drugs such as propyl-thiouracil or by x-ray is causative. Overenthusiastic use of radioactive iodine (I^{131}) in treatment of the diffusely hypertrophic gland may lead to hypothyroidism.

5. As part of more extensive glandular deficiency, especially panhypopituitarism.

6. What part dietary factors may play in any given case is difficult to determine, but certain such factors may be considered. The thyroid requires an intake of 1 mg. of iodine daily for its normal functioning, together with the nutritional requirements of tyrosine or phenylalanine from which thyroxin is formed. The dietary vagaries of the senescent individual are well known and where pronounced may be significant.

Most commonly there is no known antecedent cause. Involutionary change in the thyroid, the pituitary gland, and in the adrenals seems just as normal a process as is the developmental and evolutionary.

Q. Does it alone have a poor prognosis?

A. Not so far as life is concerned, except that, in unrecognized and severe cases, death may result from intercurrent infection or cachexia and stupor.

Q. Is the condition common in elderly people and are there areas in which it is endemic as is cretinism?

A. There are no known endemic areas. The condition is not a rarity nor is it very common. Accurate statistics are not available since it is not reportable. Monroe, writing in 1950 on about 8,000

people over 61 years of age admitted to Peter Bent Brigham Hospital, found only about 1 per cent with hypothyroidism with or without myxedema. Experience in general office practice reveals a number definitely larger than this by at least three times because the condition is seldom so disabling as to need hospitalization. Because of its insidious, slow onset, many cases go unrecognized. Information at hand shows that it is more common in England than in the United States and five or six times more common in women than in men.

Q. Is there any known relationship between hypothyroidism and arteriosclerosis?

A. We know that the hyperthyroid and euthyroid individual usually shows amounts of lipids, such as cholesterol in the circulating blood, significantly lower than in the hypothyroid. No known increase in arteriosclerosis is shown, however, in hypothyroid individuals. Dr. William B. Kountz believes that hypothyroidism or occult myxedema is significant in the pathogenesis of arterial wall degeneration. Much more research is required to establish this concept.

Q. What are the symptoms and the criteria for diagnosis?

A. There are no specific symptoms or signs except when myxedema is present, and this is difficult to recognize when not marked. Dry scanty hair, dry skin, slow pulse, loss of vigor and initiative, sensitiveness to cold, muscle cramps, weight gain, constipation, hoarseness, changes in personality and in mental capacity should suggest the condition, although each or all may occur in the senescent period without hypothyroidism. Also suggestive are dull early headache after rest, especially in the early morning and disappearing with activity; a tendency to fall asleep at any time; and physical weakness, so that the patient has to force herself to do anything. The diagnoses commonly include nervous "breakdown," exhaustion and indigestion, "neurasthenia," anemia, constipation, and vascular hypotension. With myxedema, there is puffiness of the face, changed texture of the skin, swollen legs, anemia, and high blood cholesterol. In some cases, the heart is dilated, but effusion into the pericardium is more common. Rarely is there fluid in the pleural or abdominal cavities. There is no true congestive failure in most cases despite the cardiac dilatation. The electrocardiogram shows ventricular complexes of low amplitude. Weakness and dyspnea but not orthopnea are noted.

Q. What is the treatment? Can cure be expected?

A. The fundamental hypoactivity of the thyroid gland is not cured. Substitution therapy, supplying the thyroid hormone is very effective and is usually tolerated. Dried thyroid substance is given by mouth in very small doses to begin with—1/6 to ¼ grains (10 to 15 mg.). Increases should be very slow, avoiding angina pectoris, left ventricular failure, or tachycardia. Average maintenance dose is 60 to 120 mg. thyroid U.S.P. Under proper management, the symptoms and signs slowly disappear. Blood cholesterol values are reduced. If there is myxedema, the characteristic thickening and swelling of skin disappear. If there is cardiac or pericardial involvement, the enlarged x-ray silhouette shrinks to normal size and the electrocardiographic tracing returns to its normal pattern. Symptoms caused by the hypothyroid state disappear. Continuance of the minimal effective dose is necessary and requires watchfulness. It is not necessary to secure an elevated basal metabolic rate. Rates approximately −10 per cent are usually adequate. Failure with this regimen suggests an erroneous diagnosis.

SOCIOMEDICAL PROGRESS

Recruiting the professional nurse to the nursing home setting

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The social organization of the nursing home has certain inherent advantages which could enable the nurse to achieve her personal and professional goals. This conclusion merits further examination because of the implications for the nursing home, nursing profession, and patient.

◆ The nursing home is one of the more recent health services in the nation. It meets a demand for a facility that stands between the hospital and the home. Almost nonexistent twenty-five years ago, it is estimated by the Commission on Chronic Illness that there are now in the United States some 25,000 nursing homes with some 450,000 beds.[1] Since population trends indicate that persons over 75 years will continue to increase, we may anticipate that the demand for the nursing home will continue to grow.

Much of what has been written and said about the nursing home has dealt with desirable standards, the care of the patient, and his social and psychologic needs. This is perhaps as it should be. Community groups, whether they are public agencies or local private organizations, are deeply concerned with the care the patient receives in these homes.

Apparently, adequate care for the patient in the nursing home is contingent on a number of factors. One of the most significant of these is the availability of well-trained professional personnel. The medical profession and other leaders in the health field have long recognized and deplored the acute shortage of nurses. However, a recent publication contends that between 1910 and 1950 the nursing profession grew at a faster rate than the general population.[2] In 1910, there were 55 active graduate nurses for every 100,000 inhabitants. By 1950, the ratio of active graduate nurses increased to 249 per 100,000 inhabitants. Further evidence of nursing as an attractive occupation is found in the fact that between 6 and 7 per cent of the women high school graduates entered nursing during the past decade.[3] Likewise, a recent study made at Cornell University shows that 7 per

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cent of the urban students and 18 per cent of the rural students chose nursing.[4] The paradox of the apparent increase of nurses, on one hand, and the stated shortage on the other, has led the American Nurses Association to comment: "The professional nurse ratios suggest that reported shortages of nursing personnel reflect more the increasing needs for those health services which have become the responsibility of professional nursing personnel rather than a diminishing supply of professional nurses."[5]

Therefore, if nursing homes have difficulty in recruiting nurses, it is not because of a diminishing supply but rather because they are not getting their share of nurses along with the other health services in the community.

Recruiting Problems

The purpose of this paper is to explore some factors involved in recruiting the professional nurse to the nursing home. Within the nursing home, the nurse is the key professional person. Nevertheless, because of limited knowledge, the nurse has often overlooked employment opportunities in this setting.

Examination of several studies of occupational choice undertaken at Cornell University by the Department of Sociology and Anthropology and the Department of Rural Sociology may give insight into the problem of attracting the nurse to the nursing home.[6] People are frequently asked: "How did you happen to get into this kind of work?" and "What do you like about your work?" Such questions are raised because choosing a career is one of the most important decisions to be made in life. Selection of a particular kind of work has important consequences for both individual and society. Sociologists accept the principle that society is organized so that people do what is to be done in order that the society may function and prosper. The consequences of choosing a particular occupation determine the social world in which the person will move, his economic well-being, and his feelings of self-esteem. An examination of the process of occupational choice indicates that selection of a career is intimately associated with a person's philosophic position, his conception of "good" and "bad," and a host of other characteristics.

Factors in Choosing a Career

In order to determine what satisfactions people seek in choosing an occupation, students at Cornell were asked which of 10 characteristics of a job or profession were most important to them.[7] The preferred job, they said:

1. "Provides an opportunity to use my special abilities or aptitudes."
2. "Provides me with a chance to earn a good deal of money."
3. "Permits me to be creative and original."
4. "Gives me social status and prestige."
5. "Gives me an opportunity to work with people rather than things."
6. "Enables me to look forward to a stable, secure future."
7. "Leaves me relatively free of supervision from others."
8. "Gives me a chance to exercise leadership."
9. "Provides me with adventure."
10. "Gives me an opportunity to be helpful to others."

An analysis of the responses revealed three major categories. One category found students who said that an opportunity to work with people rather than with things, or an opportunity to be helpful to others was most important. These students were planning to enter the occupations of social work, teaching, personnel work, and nursing. The second category consisted of those who selected high income or social standing as the most important characteristics. The careers chosen by these students were: business, advertising, and salesmanship. The third category was made up of students who wanted an opportunity to be creative and original. In this group,

occupations in the field of art, journalism, and architecture were chosen.

Evidently, then, there are a number of occupations that provide the satisfactions that people hope to find in a career. Satisfactions alone, however, are not the sole determinant. Also important in choosing a career is the image, or picture, that a person holds. This image emerges from the social experiences of the individual and is a composite of the information, sentiments, and activities that are attained during an individual's lifetime. The image may be accurate or distorted, detailed or unclear.

Results from the studies at Cornell showed a relationship between the occupational image and the choice of a career.[8] This is revealed by comparing the relative appeal of social work and nursing. Few students expressed an interest in social work. At the same time, these students evidenced a lack of information on the activities of social workers. In addition, they held a distorted and negative view of the field of social work.

Why Nursing?

For those who selected nursing as an occupation, the image likewise was misrepresented, but in the direction of being overly positive. Most students exaggerated the glamor to be found in a nursing career. The characteristics attributed to the nurse were not too different from those depicted by the mass media: the beautiful, immaculately uniformed girl, slightly starry-eyed, and eager to give tender, loving care to sick people. This is not to suggest that the nurse may not be all of these, but rather that the image omits the harsh realities of nursing, the difficulties of the job, the daily demands of the work routine, the monotony, and the regulations.

It has been shown that most women go into nursing because they want to work with people and to help people. These sentiments are reinforced in the training the nurse receives. Current training methods have generally accepted the theories which maintain that "organic" diseases have an emotional component. The nurse is taught that patients are people, that it is necessary to treat the person as a whole, and that emotional support is important. However, studies of the role of the nurse in the hospital reveal a discrepancy between the training she receives and the manner in which she performs her daily tasks.[9] In part, this results from the increased complexity and specialization of the general hospital which limits the opportunities of the nurse to relate herself to the patient in a warm, personal manner. Moreover, the social interrelations within the hospital setting relegate the nurse to a position subordinate to the physician and other professional people. To compensate for her subordinate position, the nurse sometimes assumes an overprofessional attitude which reduces her ability to treat the patient as a person.[10] Thus, the contemporary hospital often restricts the nurse from achieving certain personal and professional satisfactions. This does not imply a lack of positive features in the work situation of the hospital, nor lack of recognition that the hospital provides, and will continue to provide, the nurse with the principal source of employment.

On the other hand, it would seem that the negative aspects of the nursing home have been communicated to the nurse. In view of this, it might be fruitful to discover whether the nursing home possesses certain inherent characteristics which are conducive to attracting the nurse.

Satisfactions in Nursing Home Career

To begin with, the basic service rendered in the nursing home is nursing care, and the key professional person is the nurse. In contrast to her position in the authority structure of the hospital, the nurse

in the nursing home is on a more equal basis with other professional personnel. At the same time, there exists less specialization of occupations within the social organization of the nursing home when compared with the general hospital. Consequently, the nursing home environment may offer the nurse greater opportunity for creativity, initiative, and imagination. In the nursing home, the daily routine of the nurse is more conducive to frequent and intimate face-to-face contact with the patient. It appears, therefore, that within the nursing home setting the nurse could find gratification of certain personal and professional goals.

The conclusions of this paper are offered as tentative. It is suggested that because of the possible significance to the nursing home administrator, to the patient in the nursing home, and the nursing profession, that the problem of recruiting the professional nurse to the nursing home be given further study in subsequent research.

An adaptation of this paper was read at the Continuation Course in New Developments in Nursing Home Care, University of Minnesota, June 14, 1956.

REFERENCES

1. SOLON, J., and A. M. BANEY: Ownership and size of nursing homes. Pub. Health Rep. 70, No. 5, 1955.
2. American Nurses Association: Facts about nursing, 1954.
3. Ibid.
4. RAMSEY, C. E., B. L. ELLENBOGEN, and P. TAIETZ: Studies in Occupational Choice. In press, Department of Rural Sociology, Cornell University.
5. Ibid.[2]
6. ROSENBERG, M., E. SUCHMAN, and R. GOLDSEN: Occupations and values. A forthcoming work. See also Studies in Occupational Choice.[4]
7. ROSENBERG, M.: Ibid.[6]
8. ELLENBOGEN, B. L., P. TAIETZ, and C. E. RAMSEY: Occupational image as a factor in selection of nursing as a career; TAIETZ, P., C. E. RAMSEY, and B. L. ELLENBOGEN: The choice of social work as a career; TAIETZ, P., C. E. RAMSEY, and B. L. ELLENBOGEN: The influence of the image of social work on the choice of social work as a career. Studies in process in the Department of Rural Sociology, Cornell University, Ithaca, New York.
9. BROWN, E. L.: Nursing for the Future. Russell Sage Foundation, 1948.
10. DEVEREUX, G., and F. A. STEINER: The occupational status of nurses. Am. Sociological Rev. 15: 628-34, 1950.

RESECTION of malignant neoplasms of the esophagus is often justifiable for palliation even though cure is impossible. Of 115 cases explored, 64 were resectable with a five-year survival rate of 8 per cent. This criterion of cure would have greater significance if the surgeon would classify the results of surgery as (1) complete eradication with presumed cure, or (2) resection for palliation only. The true value of palliative resection in regard to duration of life could be more easily determined if operative deaths were not included in survival statistics. After the initial impact of surgery, survivors of resection appear to live more comfortably than patients not subjected to surgery.

Of 138 obstructive esophageal neoplasms in patients in a private and general hospital, 111 were squamous-cell in histology and 27 were adenocarcinoma extensions from the cardia of the stomach. Except for a large number of lesions in the mid-third of the esophagus, a gradual increase in incidence was observed from the cricoid to the cardia. Patients with lesions of the middle and lower thirds of the esophagus generally survived longest after resection.

Tumors appeared most often after the fifth decade, and occurred four times as frequently in men as in women.

J. E. MACMANUS, J. R. PAINE, J. DUNN, and W. MERDINGER: Carcinoma of the esophagus. Surgery 40: 510-514, 1956.

CLINICAL REPORT

Myasthenia gravis

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A case of myasthenia gravis in a 75-year-old man is described, calling attention to this condition in geriatric practice.

◆ Myasthenia gravis is a chronic state of excessive fatigability of the striated muscles without corresponding anatomic changes in the nervous system or in the muscles proper, except for occasional lymphorrhagias.[1] The presence of a toxic substance has been assumed. The favorable response of the myasthenic state to cholinergic drugs encourages the view that a curarelike substance acts on the end-plates of striated muscles in antagonism to acetyl choline.[2]

Since 1903, myasthenia gravis has been linked with thymic changes,[3] and it has been estimated that about 15 per cent of myasthenic patients suffer from thymic tumors.[4] In a series of 155 cases reported by Keynes, a thymic tumor was found in 11.6 per cent. Even in patients without tumor, histologic abnormalities in the thymus are reported in about 75 per cent of cases.[6] Thymic extract from myasthenic patients produced a neuromuscular blocking effect on isolated rat phrenic nerve diaphragm preparation, while controls with thymic extract from normal patients failed to give definite results.[7]

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Case Report

The following case is reported as an example of myasthenia gravis in a geriatric patient, with its attendant problems in diagnosis.

Patient A. B., a cultured man of 75, moderate in habits and with an uneventful history, had been quite well until onset of an upper respiratory infection late in February 1955. He was afebrile in a few days. When seen in consultation early in March, he complained of abdominal distention which impeded respiration and gave a feeling of oppression in the chest. He was constipated but was unable to strain, and could not help voiding the bladder at the end of micturition. The flow of urine was free and of normal frequency.

None of the motor muscles innervated by the cranial nerves was affected. There was no diplopia or ptosis; the face had expressive features; voice and speech were normal; and there was no difficulty of mastication or of deglutition. He mentioned unusual weakness of the limbs, but did not stress the complaint. There was some decrease in the motor power of the limbs, some general atrophy of the muscles, and the deep reflexes were difficult to elicit. At the time, these changes were not considered to go beyond what could be expected at the patient's age and state of convalescence from

infection. No fasciculation of the muscles was detected; coordination was good and sensation normal.

The abdomen was distended and tympanic; there were no abdominal reflexes. Respiration was rapid and superficial; there was little emphysema. Few rales were detected at either base. The general condition was fair. The other systems had only such changes as were compatible with old age. Blood pressure was 155/90. Urine was normal.

Seen in retrospect, this picture suggests myasthenia, but diagnosis was not reached on this occasion. The patient improved rapidly, but two weeks later had an attack of dyspnea provoked by a fit of coughing. During later attacks, he had a rattling noise in the throat and diffuse rales in the chest. Cough was too weak to clear the passages. In mid-April he was unable to swallow.

When seen again in consultation, there was ptosis, drooping face, and slurred speech. He lost motor power of the limbs, and the deep reflexes were absent. A subcutaneous injection of 1 mg. neostigmine methyl sulphate caused the symptoms to regress within fifteen minutes, and the patient commented that his motor power was back. He was up and about with two 2.5-mg. doses of parenteral neostigmine and one oral 180-mg. dose per day.

He still had asthenia but refused increase in dosage, as the drug caused abdominal cramps and frequent intestinal peristalsis. He also refused administration of atropine, but not much pressure was brought on him to take the drug in view of his advanced age.

Before the effects of pyridostigmine could be tried, he contracted another respiratory infection early in October: a myasthenic crisis developed and he died within a few days. A roentgenogram of the chest taken during this last illness did not reveal any abnormal shadow.

Discussion

The therapeutic effects of neostigmine and the rapid and specific diagnostic tests that followed its discovery[8-10] have aided greatly in removing myasthenia gravis from the group of medical curiosities. But, by accepted standards, myasthenia gravis is still a rarity, with an incidence that makes difficult the accumulation of a sizable group even in large centers of population. In Malta, with a population of about 300,000, there is hardly a case reported every two years.

Yet it is legitimate to assume that not all cases are detected. The rarity of the disease and its tendency to mask itself under protean forms make diagnosis difficult. The disease has a predilection for all muscles innervated by the cranial nerves, and, probably at one time or another, all myasthenic patients manifest some paralysis of one or more of these muscles. Excessive fatigability of the cranial muscles is the most characteristic symptom of this disease. Paralysis of these muscles rarely fails to attract the attention of the patient or of the clinician and makes diagnosis fairly easy. But those muscles may not be paralyzed at onset of the disease and years may go by before paralysis appears. This sequence of events is possible also in the aged; the myasthenic state may pass unobserved because the span of life is too short.

Myasthena gravis tends to spontaneous remissions. In a group of 87 patients whose myasthenia gravis was untreated by specific drugs or by thymectomy, 31 per cent had complete remission for an average of two years.[11] But partial remissions are also common and many myasthenic patients present only mild symptoms at all times. These cases can be easily missed, particularly in old age. Their mild fatigability may be attributed to senility unless the possibility of myasthenia gravis is kept constantly in mind.

Not long ago, it was believed that myasthenia gravis did not occur in advanced age. Five years ago, it was stated that the age distribution of the disease extends from infancy to the sixth decade.[12] In case reports of 250 patients collected by Booth in 1908, 6 patients were between 60 and 70, and the oldest was 70.[13] In a group of 357 patients consisting of 165 men and 202 women, which was studied by Schwab and Leland, 30 per cent of the men and 6 per cent of the women had onset of the disease when they were over 60.[14] Five per cent of the men and 2 per cent of the women were over 70, but none was more than 71. In Ferguson's series of 75 cases, one in a 71-

year-old man is mentioned. The patient in our history was 75 when he first complained of myasthenic symptoms. He seems to be the oldest patient on record.

Thus myasthenia gravis should not be thought of as a disease which begins in early adult life. It tends also to appear in late maturity, particularly in men, as was stressed recently by Schwarz and King.[16]

REFERENCES

1. RUSSELL, D.: Histological changes in striped muscles in myasthenia gravis. J. Path. & Bact. 65: 279, 1953.
2. WILSON, A., and H. B. STONER: Myasthenia gravis—consideration of its causation in study of 14 cases. Quart. J. Med. 37: 1, 1944.
3. WEIGERT, C.: Pathologisch-anatomischer Beitrag zur Erbschen Krankheit. Neurol. Zentralbl. 20: 597, 1901.
4. CLAGETT, O. T., and L. M. EATON: Thymectomy in treatment of myasthenia gravis; report based on 32 cases. J. Thorac. Surg. 16: 62, 1949.
5. KEYNES, G.: Results of thymectomy in myasthenia gravis. Brit. M. J. 2: 611-616, 1949.
6. CASTLEMAN, B., and E. H. NORRIS: Pathology of thymus in myasthenia gravis. Medicine 28: 27-58, 1949.
7. WILSON, A.: Myasthenia gravis. Glasgow M. J. 33: 381-394, 1952.
8. VIETZ, H. R., and R. S. SCHWAB: Prostigmine in diagnosis of myasthenia gravis. New England J. Med. 213: 1280, 1935.
9. TETHER, J. E.: Intravenous neostigmine in diagnosis of myasthenia gravis. Ann. Int. Med. 29: 1132, 1948.
10. OSSERMAN, K. E., and L. I. KAPLAN: Rapid diagnostic test for myasthenia gravis. J.A.M.A. 150: 265-268, 1952.
11. KENNEDY, F. S., and F. P. MOERSCH: Myasthenia gravis, clinical review of 87 cases observed between 1915 and early part of 1932. Canad. M.A.J. 37: 216, 1937.
12. KEYNES, G.: Myasthenia gravis. Brit. Surg. Pract. Lond. 6: 136, 1949.
13. BOOTH, J. A.: Report of a case of myasthenia gravis pseudoparalytica with negative pathological findings. J. Nerv. & Ment. Dis. 35: 690, 1908.
14. SCHWAB, R. S., and C. C. LELAND: Sex and age in myasthenia gravis as critical factors in incidence and remission. J.A.M.A. 153: 1270-1273, 1953.
15. FERGUSON, F. R., E. C. HUTCHINSON, and L. A. LIVERSEDGE: Myasthenia gravis, results of medical management. Lancet 2: 636, 1955.
16. SCHWARZ, G. A., and G. KING: Neuromuscular diseases of later maturity. Geriatrics 10: 197-207, 1955.

THE PROGNOSIS of lymphomas of the stomach treated with combined surgical removal and irradiation is much better than that of treated carcinoma of the stomach. The average age of patients with this condition is slightly over 51, and more than three-fourths of patients are between 40 and 70 years of age.

Abdominal pain unrelieved by food or antacid, weight loss, anemia, and history of gastrointestinal bleeding are signs which arouse a suspicion of malignancy. Correct histologic diagnosis cannot be established by physical, laboratory, or roentgenographic findings.

At laparotomy the gross lesion often cannot be differentiated from carcinoma, since the neoplasm most commonly appears as a localized ulceration of the gastric mucosa. Intramural involvement alone, or with mucosal ulceration, is the next most frequent gross finding. The adjacent lymph nodes may be enlarged, but this does not always indicate tumor spread, and does not act as a deterrent to definitive surgical removal. Correct diagnosis can be made by examination of stained, frozen sections, and should be done before deeming a gastric neoplasm unresectable.

Over one-half of patients with lymphomas of the stomach, who survive curative surgery, are alive five years later. It is thought that postoperative irradiation, because of the radiosensitivity of lymphomas in general, will add to the survival rate.

B. THORBJARNARSON, J. M. BEAL, and J. M. PEARCE: Primary malignant lymphoid tumors of the stomach. Cancer 9: 712-717, 1956.

Editorial

Recognition of thoracic emergencies

THE ARTICLE by Dr. Duane Carr which appears in this issue should be read with care because in it he describes vividly a number of intrathoracic emergencies of the aged, the true nature of which is often missed by the physicians who see the patient.

Years ago, when I was teaching clinical pathology and had to examine hundreds of stools, I was often impressed by the size of the boluses swallowed by many, old, toothless, and not too wide-awake persons. I wondered then how these large masses of meat and large cores of tomatoes ever got down the esophagus and through the cardia. Actually, as Dr. Carr says, the big bolus sometimes sticks in the esophagus and then the person cannot swallow.

Diverticula of the esophagus are not uncommon and must always be thought of when an old person cannot swallow. It must be remembered also, that when a person's esophagus or cardia suddenly becomes obstructed, a carcinoma may have been growing for some time.

Many physicians who were graduated from medical school forty or fifty years ago will be interested to learn that a person suffering from acute pneumothorax can be cured by a lung surgeon who will go in and sew up the hole.

It is remarkable to see how acute an episode can be caused by an old and long-lasting diaphragmatic hernia. A physician can easily be puzzled as to whether a thoracic pain is caused by such a hernia, angina pectoris, or gallstones. I remember a stout woman with a thoracic pain who had coronary thrombosis, gallstones, and a big diaphragmatic hernia. It was interesting to unscramble her several symptoms and assign some to one lesion and some to another lesion. Fortunately, the patient got well when 25 pounds of weight were taken off her large abdomen.

WALTER C. ALVAREZ, M.D.

The biology of aging

SCIENTIFICALLY VERIFIABLE OBSERVATIONS on the biology of aging are many and varied, but it is quite impossible to develop a coherent theory of senescence which will satisfactorily cover the facts now available. Nevertheless, new facts are continually being discovered, which give an increasing number of clues about factors which may be significant in the process of aging.

Nathan W. Shock, of the National Heart Institute, has long been a leader in organizing and analyzing the various aspects of the aging problem. Recently he organized a Symposium on the Biology of Aging for the American Physiological Society (Fed. Proc. 15:938-964, 1956). Among the reports given at this symposium were "Age Changes in the Morphology of Tissues and Cells," by Warren Andrew, of the Department of Anatomy of Bowman Gray School of Medicine; "Cellular Physiology and Aging," by L. V. Heilbrunn, of the

University of Pennsylvania; "Cellular Metabolism and Aging," by Charles H. Barrows, Jr., of the National Heart Institute; and "Comparative Physiology of Aging" by A. I. Lansing, of the Department of Anatomy, University of Pittsburgh.

Papers of the symposium give an excellent summary of current information on the essential biology of aging. Dr. Shock points out the importance of approaching the problem of aging with a wide variety of technics. He reminds us that years ago Raymond Pearl demonstrated the importance of genetics in the determination of longevity. He also points out that there must be many more detailed studies in anatomy, physiology, and biochemistry with respect to the aging process, covering a wide range of living things, in order to get testable hypotheses regarding the process of senescence.

Warren Andrews suggests that the term "senile fibrosis" is an oversimplified expression for a complex process, and that the primary change in aging seems to be in the parenchymal cells. He indicates further that the gross changes of fibrosis and adipose tissue invasions are secondary rather than primary phenomena of senescence.

In regard to physiologic changes in cells during aging, L. V. Heilbrunn shows that there is an increased uptake of calcium by senescent cells. The evidence indicates that this is due to weakening of the cortex of the aging cells, so as to allow more calcium to enter. The additional calcium may then cause degenerative changes. His studies on marine egg cells suggest that there may be factors which may prevent the weakening of the cell cortex, and thus delay senescence.

Charles H. Barrows, Jr., shows that there is a decrease in over-all metabolic activity with advancing age, although it does not appear that senescence is accompanied by real decreased oxygen uptake. The matter seems to involve changes in enzyme concentration. Here is a wide field for extensive investigation involving many different kinds of living things.

As a result of comparative studies of the physiology of aging, A. I. Lansing concludes that a strong case can be made for the proposition that an endogenous mechanism is operative in the aging process, and that this mechanism is part of the general growth regulatory process.

All those who are interested in gerontology or geriatrics owe a great debt of thanks to Dr. Shock for his long and helpful program in support of fundamental work relating to aging. It is to be hoped that he will continue to bring together experts from the fundamental biologic sciences for an annual review of advances that may have been made in an understanding of the aging processes.

CHAUNCEY D. LEAKE, PH.D.
Columbus, Ohio

Something new has been added

The reader's attention is called to a new department entitled, "Queries and Therapeutic Notes," which appears on page 60 of this issue. In the first article, Dr. S. Marx White discusses the practical treatment of hypothyroidism in the elderly patient.

In subsequent issues, the practical treatment of common problems in geriatric medicine will be discussed by other recognized authorities. Each man's views will be presented in question-and-answer fashion. Subjects to be covered in forthcoming issues include: "The Treatment of Hemiplegia of an Old Person in a Private Home," "Steroid Therapy for Osteoporosis," and "Evaluation and Treatment of Hyptertension."

Book Reviews

Social Science in Medicine

LEO. W. SIMMONS, PH.D., AND HAROLD G. WOLFF, M.D., 1954. New York: Russell Sage Foundation. 254 pages. $3.50.

This book is a joint enterprise of a social scientist oriented to anthropology and a professor of clinical medicine (neurology), and is based upon a two-year cooperative study carried out at the New York Hospital-Cornell Medical Center and sponsored by the Russell Sage Foundation. This study includes four special investigations not reported in detail. They are: (1) an examination of the physician-patient relationship over extended periods of therapy; (2) an analysis of interpersonal relationships in a nursing consultation service; (3) a survey of problems in night nursing; and (4) a sociologic case study of 50 families who had made extensive use of the Cornell Medical Center Clinics.

The book explores some of the major areas of interest shared by medicine and social science. The individual is considered in three aspects: as an organism in characteristic physical surroundings; as a member of a group in society; and as an individual person in his present day culture. A special chapter is devoted to the patient's reactions to stress in a hospital environment. Some very illuminating and worthwhile ideas are presented in this multidisciplined approach to the interrelation of social forces, stressful or otherwise, and health and disease.

The extensive bibliography is arranged alphabetically by authors' names, and thus requires cross reference in the index to locate where and how a given article or text was cited. The index is almost solely devoted to such cross reference of authors; not more than 20 or so items in the index refer to the subject matter of the text.

For those interested in the broad aspects of interpersonal interaction as a factor in the genesis of impaired health, this book is worthy of study. However, this cannot be accomplished without considerable effort for there is much platitudinous gravy between the pieces of meat.

EDWARD J. STIEGLITZ, M.D.
Washington, D. C.

Treatment of Migraine

J. R. GRAHAM, M.D., 1956. Boston and Toronto: Little, Brown and Company. 149 pages. $4.00.

Here is a concise yet comprehensive book on the treatment of migraine. No effort is made to deal with other types of headache. Written in a style that is simple and direct, this little volume accurately condenses current knowledge of migraine therapy. Within its seven chapters is found the distillation of more than twenty years' experience in the understanding and guidance of patients with headache problems. Obviously aware of the pitfalls that migraine offers to the investigator, Dr. Graham stresses throughout the practical aspects most helpful to the clinician.

Following definition of the various facets of the problem, there is an acceptable classification of migraine and its variants considered under three headings: definitely migraine, migraine equivalents, and migrinoid disorders. Only the varieties included under the first heading are considered for therapeutic management.

The problem of migraine is discussed with specific attention to diagnosis, dynamic physiologic changes, and therapy.

The chapters on treatment are prefaced by a discussion of the most useful drugs now available, with particular attention to the preparations of ergot. Their history and mechanism of action are described, and the available preparations and their toxicity are discussed. Treatment is presented under two main headings: treatment of the acute attack, and prophylactic measures to decrease frequency and severity of future episodes. Sensible objectives are set up and drug therapy is put in its proper perspective along with the general management of the patient and his daily routines. Practical advice regarding general measures is also included. Brief illustrative cases are presented in each important category.

This volume should be helpful to any physician who undertakes the treatment of migraine and also to those who would study its nature and causes.

E. DOUGLAS ROOKE, M.D.
Rochester, Minnesota

Elements of Healthful Living

HAROLD S. DIEHL, M.D., 1955. Third edition. New York: McGraw-Hill Book Company, Inc. 357 pages, illustrated. $4.50.

The public need for clear, readable, concise, and accurate information in matters of health is constantly growing in both urgency and importance. As the burdens of the chronic progressive disorders of later years increase, so does the unavoidable necessity of improved public enlightenment, for these diseases are

largely endogenous and their prevention and retardation are chiefly matters of wiser living in youth and early adult life. Education in truly healthful living is the best form of constructive or anticipatory geriatric medicine.

Thus we welcome this third highly effective abridgment of Dr. Diehl's well-known college "Textbook of Healthful Living," now in its fifth edition. The present revision includes developments in personal health maintenance as a facet of preventive medicine and new charts and tables to bring data up-to-date. Though the words "age," "elderly," "maturity," "senescence," and "senility" do not appear in the index, there is a chapter entitled "Health Problems of Advancing Years." This, unfortunately in common with much of the rest of the text, deals not with health problems but with problems of disease. There are descriptive sections on degenerative cardiovascular disease, cancer as though it were a single disorder rather than a group of neoplastic diseases each unique in many characteristics, rheumatism, respiratory illnesses, diabetes, and obesity. A total of two and one-half pages are devoted to sexual adjustments, periodic health examinations, and "how to live after forty."

It is disappointing that Dr. Diehl leaves the impression that health is the absence of disease and omits all mention of the potentialities of constructive medicine for adults. It is hoped that future revisions will incorporate modernization of ideas and viewpoints as well as facts.

EDWARD J. STIEGLITZ, M.D.
Washington, D. C.

Symposium on Atherosclerosis

The Division of Medical Sciences—National Research Council, National Academy of Sciences, 1954. Publication 338, Washington, D. C. 249 pages. $2.00.

This is an almost verbatim proceedings of a significant two-day symposium by some of the best of our American investigators in the field of atherosclerosis of the arterial tree. Clinicians were notable by their absence. This is not surprising inasmuch as the symposium was concerned almost solely with surveying the etiology of this disorder. What is curious is that this conference on a problem most commonly associated with aging was called at the request of the United States Air Force Directorate on Research and Development, generally assumed to be interested primarily in newness and youth.

This symposium is divided into five parts including anatomic considerations, reaction of arterial wall tissue to stress and injury, new technics to study blood vessels, and the role of nutrition and hormonal factors in the genesis of atherosclerosis. Taken all together, the various papers and discussions constitute an authoritative text of the state of knowledge in this area as of two years ago. How valid the concepts will be in another two years we do not know. Nevertheless, it behooves us all to make the best use possible of existing knowledge, even when admittedly tentative, and the best use is toward anticipation and prevention. Therein lies the sound logic of the interest of the Air Force.

EDWARD J. STIEGLITZ, M.D.
Washington, D. C.

New Books Received

Books and publications received will be listed here each month. Books of special interest to our readers will be reviewed later as space permits.

Individual Traits and *Morbidity in a Swedish Population*. E. ESSENMOLLER, ERIK AND COAUTHORS, 1956. Copenhagen: Ejnar Munksgaard. 160 pages.

The Eleventh Congress of Scandinavian Psychiatrists. L. EITINGER, editor, 1956. Copenhagen: Ejnar Munksgaard. 362 pages.

First National Directory of Facilities for the Aging, 1956. San Antonio: F. A. Riley & Co. 307 pages. $7.50.

Treatment of Migraine. 1956. JOHN R. GRAHAM, 1956. Boston: Little, Brown & Company. 122 pages. $4.00.

Variations in Personality. G. E. NYMAN, 1956. Copenhagen: Ejnar Munksgaard. 90 pages.

Body Measurements and Human Nutrition. JOSEF BROZEK, 1956. Detroit: Wayne University Press. 163 pages. $3.50.

Chronic Illness. T. L. WATERMAN, 1955. St. Louis: C. V. Mosby Co. 343 pages. $4.90.

Motivation and Personality. M. H. MASLOW, 1956. New York: Harper & Bros. 411 pages. $3.50.

Diagnosis and Treatment of Peripheral Vascular Disorders. D. I. ABRAMSON, 1956. New York: Paul Hoeber, Inc. $13.50.

Paper Electrophoresis. G. E. W. WOLSTENHOLME, 1956. Boston: Little, Brown and Company. 224 pages. $6.75.

Low-Fat Cookery. EVELYN S. STEAD, 1956. New York: McGraw-Hill, Inc. 180 pages. $3.95.

Hypertension. IRVINE H. PAGE, 1956. Springfield, Illinois: Charles C. Thomas Co. 109 pages. $3.00.

The Happy Life of a Doctor. ROGER I. LEE, 1956. Boston: Little, Brown & Co. 278 pages. $4.00.

Rehabilitation Literature. EARL C. GRAHAM, 1956. New York: McGraw-Hill Co., Inc. 575 pages. $13.00.

Digests
FROM CURRENT LITERATURE

Adrenal Adenomata in Elderly Diabetics

J. J. DALY. Lancet 271: 710-711, 1956.

Benign adrenal tumors are frequently discovered at necropsy in diabetic patients without evidence of endocrine disorder. Patients with tumors are elderly, obese, and, except for more extensive atherosclerosis, are no different from persons of similar age without adenomas. The diabetes is of short duration and controlled by small doses of insulin or diet alone. Arterial degenerative disease and infection are the predominating renal lesions.

Diabetes of later life and steroid diabetes are somewhat similar. Steroid diabetes is now a well-documented syndrome. Excessive output of glucocorticoids by the adrenals results in increased gluconeogenesis from protein and decreased peripheral utilization of glucose. Relative insulin resistance and negative nitrogen balance are characteristic.

Urinary excretion of corticosteroids is often diminished in diabetic patients. However, increased output of hormones, influencing carbohydrate metabolism may not be reflected in urinary ketosteroid output because of losses in extraction technics. New methods of hormone analysis may provide further evidence of adrenal factors in diabetes.

Of 20 patients studied by autopsy, 6 had adrenal adenomata. Subjects with tumors were all over 65, as were 4 of the 14 patients without adrenal growths. In 789 unselected necropsies, 31 adrenal tumors were found.

Carcinoma of the Ampulla of Vater

H. SWAN and R. R. PFISTER. Arch. Surg. 73: 764-766, 1956.

Radical resection of the head of the pancreas and duodenum for cancers of the ampulla of Vater has enjoyed considerable popularity since its introduction in 1935 by Whipple. Actually, Halsted performed the first successful operation for carcinoma of the ampulla in 1899 by resecting a portion of duodenum and adjacent pancreas with implantation of the pancreatic and common ducts into the duodenum. The intervening years have yielded few reports of five-year cures, but when the low incidence of the lesion is considered, the paucity of surgical cures is less remarkable.

Long-term survivals have been recorded following limited resections, but lesser methods generally have a gloomy history.

Many technics have been designed to deal with the pancreatic duct. One patient, who was 72 at the time of operation, had simple ligation of the main pancreatic duct and is doing well nine years postoperatively. There has been no difficulty with malnutrition or diarrhea, although pancreatin is still prescribed. The patient gained weight immediately after surgery and is now almost 82. Pathologic diagnosis was adenocarcinoma of the ampulla of Vater without lymph node metastasis. The first operation consisted of a Roux Y jejunojejunostomy and choledochojejunostomy. The precarious state of the patient necessitated the staged procedure. One month later, the duodenum and head of the pancreas were resected with gastrojejunostomy and closure of the pancreatic stump.

Oral Dibenyline in Distal Senile Obliterative Arteritis

A. M. BOYD. Lancet 271: 869-871, 1956.

Oral dibenyline is the preferred treatment for early degeneration of distal arteries in aged patients. For the final stages of obliterative arteritis with extensive thrombosis of digital arteries leading to ulceration and gangrene, dilatation of the patient vessels is achieved by sympathectomy or intraarterial dibenyline.

Dibenyline, a drug blocking the peripheral motor action of adrenalin at the neuro-effector junction, is a longlasting vasodilator. The compound does not alter inhibitory or cardiac effects of adrenalin. Dibenyline is especially desirable for treating obliterative arteritis in elderly people who may not withstand sympathectomy surgery, and whose disease is confined to the periphery and progresses slowly.

In older people, obliterative arteritis is typified by chronic ischemia confined to the extremities, often with symmetric distribution. The hands are affected more often than the feet. Raynaud's phenomenon may be the main symptom. Local gangrenous episodes are followed by periods of quiescence.

The starting dosage of dibenyline is one 10-mg. capsule at night for three days, then one capsule night and morning for four days. The

second week, dosage is increased to 1 capsule three times a day, but if necessary, 60 mg. daily may be given. Effects such as dizziness, drowsiness, nasal stuffiness, and nausea are not troublesome enough to discontinue treatment when dosage is moderate.

Best results are achieved when blood supply to the extremities is least restricted. Of 30 patients treated, healing and pain relief were evident in 12 of 17 mild cases and in 6 of 13 moderate cases.

Hypogonadism in Middle-aged and Elderly Men

J. E. KIRK. Postgrad. Med. 20: 324-331, 1956.

Because the symptoms of hypogonadism are not specific, laboratory determinations are valuable in establishing diagnosis. With advancing age, testicular androgen production decreases conspicuously, while estrogen and corticosteroid production rarely decreases.

Patients may complain of sexual impotence, tiredness, indecision, irritability, insomnia, memory loss, and inability to concentrate. These complaints may be emotionally based, or may result from senile changes. Physical examination is of little benefit in diagnosing hypogonadism in this age group unless gynecomastia is present.

The three most valuable laboratory determinations in establishing hypogonadism include the following procedures. The test for acid phosphatase concentration of prostatic fluid is simple to perform. If normal values of 8,000 to 14,000 units per cubic centimeter are found, hypogonadism is not present. Concentrations below 4,000 units per cubic centimeter are not diagnostic. Excretion of more than the normal 12 to 15 mg. of 17-ketosteroids in the twenty-four-hour urine specimen rules out hypogonadism; values less than 6 mg. are strongly suggestive of hypogonadism. A twenty-four-hour urinary excretion of follicle stimulating hormone in more than 100 mouse units indicates testicular hypogonadism; less than 4 mouse units implies pituitary hypogonadism.

Treatment of hypogonadism with testosterone may be effective in two to three weeks. A dose of 10 to 25 mg. of testosterone propionate is given intramuscularly two to three times weekly for four weeks, then reduced by half the next month. Or, 10 to 15 mg. of oral methyltestosterone daily may be prescribed. Undesirable changes in the seminiferous tubules may result if testosterone therapy is continued for more than two months. Therefore, if longer therapy is contemplated, the dose should be reduced to 15 mg. of testosterone propionate, or 15 to 25 mg. of methyltestosterone weekly.

Malignant Disease in Old Age

FLORENCE MC KEOWN. Brit. J. Cancer 10: 251-256, 1956.

Postmortem examination of patients over 70 reveals cancer second to heart disease as the cause of death, with large intestine, prostate, stomach, lungs, and esophagus most involved.

Carcinoma of the large bowel usually proves fatal because of local complications such as obstruction, perforation, or peritonitis. Less than a quarter of the cases show metastases to the liver and there is little peritoneal spread and pulmonary involvement. Dissemination of gastric carcinoma is more frequent and widespread, even soon after onset of symptoms. Nearly half of the tumors are unsuspected during life. Esophageal cancer, prodominantly a disease of men, kills by mediastinitis, bronchopneumonia, or empyema with widespread dissemination in only a few cases.

In elderly patients, carcinoma of the large intestine, stomach, and esophagus constitutes over 40 per cent of all malignancies.

Carcinoma of the prostate is the second most common tumor and the third-ranking cause of death. Postoperative complications, ascending infection, and uremia are the immediate cause of fatalities. Incidence mounts with age. If focal carcinomatous change is included, the tumor is found in 11 per cent of the men studied by autopsy.

Carcinoma of the lung, the fourth commonest tumor, occurs in twice as many men as women and does not decrease with age.

Complete postmortem examination is the only means of determining the true incidence of tumors. In this series of 1,300 examinations, 25 per cent showed malignant disease. Of the tumors discovered, 20 per cent were unsuspected and did not contribute substantially to death.

Nonpuerperal Lactation in Grandmothers

C. SLOME. J. Pediat. 49: 550-552, 1956.

Middle-aged Zulu women are reported to produce breast milk, many years after weaning their own children, as a comforter to quiet grandchildren. Five such cases are described.

Case 1. A 48-year-old grandmother put her grandchild to her breast and noted the appearance of breast milk twenty-four hours after the start of this suckling, and lactation continued for nineteen months. She had weaned her own last child eleven years before. Her menses were regular until three months after she began breast feeding and have since ceased.

Case 2. A grandmother 43 years old suckled all of her daughter's children and lactated

freely each time. Her first grandchild was breast fed fifteen years after the weaning of her last child. Breast milk appeared one week after she put him to breast.

Case 3. A 44-year-old grandmother had borne 12 children and successfully fed the 9 who survived neonatal life. The last child was weaned January 1950. Sixteen months later she put her 1-year-old grandchild to breast during the absence of his mother because "she did not want him to cry." Breast milk was secreted by the next day. Her menses remained unaffected.

Case 4. A grandmother of 45 breast fed her grandchild four years after weaning her youngest child.

Case 5. A 47-year-old postmenopausal grandmother comforted her grandchild at the breast for about three years although no lactation appeared.

The Zulu practice of suckling grandchildren has been handed down through the generations.

The Problem of Aging

K. MIESCHER. Experientia 11: 417, 1955.

Aging is defined as the sum total of those processes which cause a permanent diminution in the resistance of the organism to external and internal injury. Aging must be seen as two distinct processes: the B-processes, which are the growing phases of the organism, and which imply that the organism is becoming older; and the A-processes, which operate in one direction only and constitute the true phenomena of aging.

The declining turnover of available energy and a fall in the biotone, resulting in decreased adaptability, are part of the aging process. Biotone includes those physical and psychologic factors which are important to life: biopotentials, energy reserves and their availability, elimination of fatigue products, elasticity, functional ability, and the interplay of these forces.

Research establishes generally valid laws, but the physician is interested in the fate of the individual, and tests must be devised to determine the extent of aging, not only of the whole individual, but also of his parts and functions. Understanding of the processes of aging will indicate new therapeutic approaches.

Evaluation of psychologic and mental functions in relation to aging should be based on the same principles as aptitude testing.

Old age is the final stage of processes starting at birth. Some of these processes continue at increasing, some at decreasing speed. Other aging processes do not appear until some time between the ages of 20 and 40. This implies that adequate preventive measures should be taken early in life.

Since the processes of aging must be viewed in terms of the entire life span, research and experiments should be performed on a broad basis and with the widest scope possible.

The Establishment and Functioning of a Geriatric Program in a Health Department

W. A. HOLLA. New York J. Med. 56: 2987-2991, 1956.

A local health department's planning for the aging should provide for coordination of activities with all interested agencies and direct services such as nursing, health education, nutrition, and adult hygiene clinics for patients referred by physicians.

Geriatric services now offered by the Westchester County Health District are:

1. Home visiting by public health nurses to give hygienic advice, help carry out doctors' orders, give instruction in home nursing to members of the household, and arrange referrals to other agencies.

2. Licensing practical nurses to furnish bedside care of the aged to release public health nurses for other activities.

3. Supervision of nursing and convalescent homes, including periodic inspections.

4. Chest roentgenograms in tuberculosis clinics upon referral by physicians.

5. Rehabilitation of physical disability through orthopedic clinics, home nursing, and physical therapy.

6. Promotion of better nutrition through consultation which is available to visiting nurses, physicians, and institutions.

7. Mental hygiene clinics for study, treatment recommendations, and in some cases, therapy.

8. Distribution of printed material on adult health through nurses' home visiting and on personal request.

Other projects considered are mass education through local newspaper and radio stations and adult health conferences for elderly individuals not under a physician's care. Patterned after child health clinics, the health conferences would include a limited physical examination, health advice, and referral to a physician when more complete examination or treatment is needed.

Through the county council of social agencies, a permanent committee, representative of interested organizations and individuals, is studying needs of the aged for income, health, housing, counseling, leisure time activities, and services under religious auspices. Recommendations of the study group are taking shape through a citizens' committee.

Pneumoperitoneum in the Management of Esophageal Hiatus Hernia

MAISEL, B., W. COOPER, AND F. GLENN. J. Am. M. Women's A. 11: 299-315, 1956.

When careful medical therapy fails and surgical repair cannot be undertaken, hiatus hernia in geriatric patients may be treated introducing air into the peritoneal cavity.

Esophageal hiatus hernias may be one of the four following types:

(1) The true congenital type, which is not a hernia, but a mediastinal stomach. (2) The paraesophageal type, which is a true hernia, produced by the bulging of a segment of gastric cardia through an enlarged esophageal hiatus into the mediastinum of the pleural cavity. (3) The sliding type, in which the esophageal cardiac junction and the proximal end of the cardia dissect through the leaves of the peritoneum, and pass through the diaphragmatic hiatus into the mediastinum or pleural cavity. The closing mechanism between the stomach and the esophagus becomes incompetent, and gastric contents are regurgitated. Ulceration in the mucosa of the herniated segment of gastric cardia leads to bleeding. (4) The fourth type is a combination of sliding and paraesophageal hernias. The last three are found most frequently in women between 50 and 60.

If surgical therapy is not feasible, because of the patient's general condition, pneumoperitoneum may be required. The patient is placed in a supine position and the abdomen surgically prepared. Midway between the left costal margin and the umbilicus, a small area is infiltrated with 2 per cent procaine. A 1.75-inch, 19-gauge needle, attached to a 10-cc. syringe, is inserted in the abdominal wall until it reaches the anterior rectus sheath. A needle guard is adjusted, permitting the needle to pass for 1.5 centimeters further through the rectus muscle, the posterior rectus sheath, and the peritoneum. The needle passing through the peritoneum causes the patient to feel a slight sticking pain. To ascertain whether the needle is within the peritoneal cavity, 5 cc. of novocain are introduced. A three-way stopcock is attached to the needle, and free flow of a small amount of air indicates that the point of the needle is in the peritoneal cavity. By use of a 50-cc. syringe, approximately 1,000 cc. of air are then injected.

By producing striking visceroptosis of the stomach, pneumoperitoneum controls the hemorrhage, vomiting, rumination, and dyspepsia of hiatus hernia origin. It permits preoperative preparation of selected elderly patients for later surgical repair of hiatus hernia.

Sex Hormone Deficiency of Adrenal Origin in Older Men and Women

P. STARR. J. Chronic. Dis. 4: 321-326, 1956.

Adrenocortical deficiency in production of androgens and estrogens is one of the common causes of subclinical disease in older people. Careful observation of patients with metabolic disorders shows that hormone deficiencies serious enough to cause actual tissue damage may be asymptomatic.

Asymptomatic disorders have been well demonstrated in hypothyroidism and diabetes, and they may be present in sex steroid adrenocortical hypofunction. Postmenopausal women who have had coronary thromboses have a lack of both estrogen and thyroxine.

Estrogen and androgen production continues in both sexes after age 50 and is sustained at a significant level for the remaining decades of life. These hormones are normally produced in the adrenal cortex, but the amounts vary through life. Insufficient production of the sex hormones has not been recognized as a clinical entity because: (1) the metabolic effects are subclinical; (2) disorders of the female menopause and male climacteric have been attributed to a readjustment of the nervous system, and (3) cessation of ovarian function is normal and an abnormal state has not been considered.

Diagnosis of chronic adrenocortical sex hormone insufficiency should be considered if the autonomic postmenopausal nervous symptoms fail to clear up after a few months. Laboratory tests for this are still inadequate. The best test, at present, is the determination of the gonadotrophic pituitary hormone excretion.

Principles and Safeguards in Abdominal Surgery of the Aged

R. K. GILCHRIST and F. A. DE PEYSTER. J.A.M.A. 160: 1375-1378, 1956.

Emergency gastric resection for massive gastrointestinal hemorrhage is the commonest cause for emergency surgery in the aged patient. Patients with massive hemorrhage continuing for more than twenty-four hours should be treated surgically.

The mortality rate of emergency biliary tract surgery is much greater than nonemergency biliary surgery. The high incidence of gallbladder complications from stones indicates that cholecystectomy for "silent stones" seems justified.

Pulmonary embolism and chronic infection are important causes of death in elderly postoperative patients. Chronic infections of the pelvis or abdominal wall are laid wide open early. The Hartmann operation of abdominal excision of the rectum for carcinoma should not be used because of high risk of infection.

Activities and Announcements . . .

Fourth International Gerontological Congress

Scientists and other professional personnel in fields associated with aging will meet at the Fourth International Gerontological Congress in Merano, Italy, July 14 to 19, 1957. Laymen are also invited to attend this meeting.

All abstracts of papers to be presented at this Congress must be submitted to the North American Committee of Cooperation for review before acceptance. The chairman of this committee is Dr. E. V. Cowdry, Washington University School of Medicine, 660 South Kingshighway, St. Louis, Missouri.

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Third Merrell Symposium on Aging

The third annual Merrell Symposium on Constructive Medicine in Aging will be held at the Netherland Hilton Hotel in Cincinnati on January 17, 1957. The subject for the 1957 meeting, which is open to all interested physicians, will be *Cardiovascular Disorders in the Aging*. Papers will be presented by the following speakers:

K. J. Franklin, Medical College of St. Bartholomew's Hospital, London, "Investigation of What Is Considered Normal for the Aging Cardiovascular System"

J. Earl Estes, Jr., Mayo Clinic, Rochester, Minnesota, "Venous Disorders in Older People"

Walter S. Priest, associate professor of medicine, Northwestern University School of Medicine, "Anticipation and Management of Cardiac Decompensation"

Jessie Marmorston, professor of experimental medicine, University of Southern California, "Hormonal Aspects of Myocardial Infarction in Female and Male Subjects"

Ancel Keys, professor of physiology and director of the Laboratory of Physiological Hygiene, University of Minnesota, "Calories and Cholesterol"

Robert W. Wilkins, associate professor of medicine, Boston University School of Medicine, "Drug Therapy for Hypertensive Vascular Disease in Patients Past Midlife"

Robert A. Bruce, associate professor of medicine, University of Washington School of Medicine, "Evaluation of Functional Capacity in Patients with Cardiovascular Disease"

Edward J. Stieglitz, consultant in geriatrics, Veterans Administration and St. Elizabeth's Hospital, Washington, D. C., "Integrated Unity of the Patient"

Postretirement Teaching

The *John Hay Whitney Foundation* has announced the appointment of 12 distinguished professors emeriti under its Visiting Professors Program for 1956-7. Dedicated to the teaching of the humanities, the program maintains a register of emeriti professors for use of teaching institutions and of those interested in doing postretirement teaching. The Foundation's address is 630 Fifth Ave., New York City.

•

Ciba Foundation Award Winners

Dr. James E. Birren and Dr. Jack Botwinick, of the Section on Aging of the National Institute of Mental Health, Public Health Service, were recipients of 1956 awards for research on aging offered by the Ciba Foundation in London. The subject of their investigation was "Studies on Age Changes in Speed of Simple Responses."

•

New Geriatric Center

The Brooklyn Hebrew Home and Hospital for the Aged is planning to build a $3,000,000 geriatric center for the study and treatment of diseases of the aged. The new six-story building will be erected adjacent to the hospital division of the home. The first two floors will house a basic research laboratory and the upper floors hospital beds and clinical units.

•

Conferences on Hiring Older Workers

A series of regional meetings on widening employment opportunities for older workers has been scheduled for New York State as part of a program of conferences dealing with the three major problems of the aging—employment, health, and social welfare. The employment conferences, which began in mid-November, will extend through May 1957. They will be held in Rochester, Hempstead, Utica, Syracuse, Binghamton, White Plains, and Buffalo.

•

Public Housing for Single Older Persons

The Seattle Housing Authority has approximately 200 one-bedroom apartments in their three housing projects which are available to single elderly persons whose incomes do not exceed $2,800 a year. Rental rates are based on actual income ranging upward from $27.00 a month including utilities and heat. These units are available as a result of the recent amendments to the Federal Housing Act which for the first time permits single older persons to

rent homes in a federally-aided public housing project.

•

Course on Fractures and Trauma

An intensive course on fractures and other trauma will be offered by the Chicago Regional Committee on Trauma of the American College of Surgeons from April 10 to 13, 1957, at the John B. Murphy Auditorium, 50 East Erie Street, Chicago. Subjects to be covered include: bony trauma, vascular injuries, bone grafting, traction technic, industrial casualties, farm injuries, burns, amputations, and head injuries.

•

New Appointments

Dr. Alvin I. Goldfarb has been appointed consultant on psychiatric services for the aged in the New York State Department of Mental Hygiene. The function of the new position, created by action of the 1956 Legislature, will be to coordinate geriatric problems and help in planning for the aged mentally ill.

Dr. G. Halsey Hunt has been appointed as director of the new Center for Research on Aging, to be set up at the National Institutes of Health, Bethesda, Maryland.

William C. Fitch, assistant to the director of the Bureau of Old Age and Survivors Insurance of the Social Security Administration, has been named director of the special staff on aging in the U. S. Department of Health, Education and Welfare.

Conference Reports . . .

Minnesota Governor's Conference on Aging

A groundswell of public interest in geriatrics brought nearly 700 persons to the first Conference on Aging called by Minnesota's Governor Orville L. Freeman, which was held in Minneapolis November 26 and 27.

Jerome Kaplan, special assistant on aging to the governor, and Prof. Walter V. Vivrett of the University of Minnesota school of architecture, who was chairman of the conference, assembled more than 100 experts and resource people to lead the discussions of 14 workshop sessions. Areas of interest included employment and retirement, education, housing, health services, social and economic factors, recreation and community programs.

There was endorsement of a proposal that counties employ specialists in aging, similar to county agricultural agents, to stimulate and coordinate efforts of community groups in meeting the challenge of advancing age.

From the employment and retirement workshop came the suggestion that ability to work rather than age should determine when a person retires. Need was expressed for pre- and post-retirement counseling through social agencies, unions, employers and churches.

Education for older adults should take its place with elementary and secondary education, another workshop reported, and should be concerned especially in helping provide work substitutes and social adjustments. Importance of using the experiences and skills of the oldsters in long-term, nonvocational community services was stressed. A permanent state director of adult education would be valuable to local programs. The workshop recommended legislative appropriations for increased library service in rural areas and to pay transportation costs for persons attending adult education classes.

The new federal housing amendment under which nonprofit organizations can insure mortgages for nursing homes up to 90 per cent was hailed as opening a new era in housing for the aged by the workshop on architecture and design. The group favored cottage-type apartment units with recreation and infirmary areas for future homes for the aged.

A sharp split between public health and medical people on one side and church groups and proprietary nursing home operators on the other developed on the issue of where nursing homes should be located. Public health spokesmen urged nursing homes, particularly chronic care facilities, be operated adjacent to and in conjunction with general hospitals. Those opposing that idea declared the last place an older person wants to go is a hospital. They suggested nursing homes include infirmaries for intensive care cases. The workshop group favored additional state subsidies for visiting nurse programs and establishment of community mental health clinics.

Among the speakers who participated in the conference were Dr. Edward J. Stieglitz, Washington, D. C., consulting editor of *Geriatrics*, and two associate editors, Dr. Wilma Donahue, Ann Arbor, Michigan, and Clark Tibbitts, Washington, D. C.

Ninth Michigan Conference on Aging

Health for the Aging was the theme for the ninth annual conference on aging held at Ann Arbor, July 9 through 11, by the University of Michigan Division of Gerontology. On this theme were centered the discussion of the three seminars, the panels of the nine workshops, the lectures of the general assemblies, and the clinics at the university hospital. The more than 750 registrants included physicians,

(Continued on page 52A)

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- no blood dyscrasias, liver toxicity, Parkinson-like syndrome or nasal stuffiness
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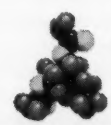

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Conference Reports . . .

(Continued from page 78)

social workers, representatives of federal and state government agencies, psychologists, hospital and nursing home administrators, and other persons concerned with the health care of older people.

Because of the rapidly changing social scene, gerontologists find themselves challenged with the increasing health needs of the older population—needs which will be still more urgent tomorrow. Two of the seminars inquired into the educational programs designed to meet these needs—the first dealing with medical school teaching and hospital training programs and the second with professional training in gerontology. Medical schools are being alerted to the demand for such training, but find it difficult to add more courses to their overcrowded schedules. Some of this training can perhaps be offered by the graduate schools. Three possible levels of professional training were outlined in the second seminar, as well as the professional opportunities which are now offered in service to the aged.

Another urgent matter presented was that of financing health care. Health costs admittedly run higher with age—a $102 yearly average for those over 60 as against $65 for those under 60. This problem has many facets—the solution will be met on different levels and help come from many sources. Health insurance for the aged, which has not been feasible because of the high premiums necessary, is under study by industry and the life insurance companies.

Interesting reports came from the seminar on research in health and the aging process. The consensus was that aging is a definite biologic process; that the aging organism is characterized by increased rigidity biologically, psychologically, and socially; and that there is great individual variation in rate and extent of aging. The answer to why aging occurs may be sought in study of the simple-celled animals, in which true, old postmitotic cells may be found. Among topics discussed in this seminar were the biomechanisms of aging, serologic and neurologic changes, and the relation of age changes and employability.

As in previous years, the conference gave an intensive survey of the newest developments in one important aspect of gerontology. Perhaps none of the problems of health of the aging was completely solved, but they were stated, discussed, and various approaches were suggested. Great stimulus to constructive thought and action was found in the workshop groups, where each participant was given an opportunity to learn, to exchange ideas, and perhaps contribute some plan he had found workable in meeting the everyday problems of the aged.

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Manufacturers' Activities . . .

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•

Soothing Cream for Skin Disorders

Tashan Cream Roch, a multivitamin cream for relief of irritation, pain, and itching in a variety of skin disorders, has been released by Hoffman-La Roche, Inc., Nutley, New Jersey. It contains ample amounts of vitamins A, D, E, and panthenol, and is likely to prove especially useful for symptomatic relief in sunburn, ir-

(Continued on page 58A)

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[1]Levy, S.: J.A.M.A., 153:1260-1265, 1953.

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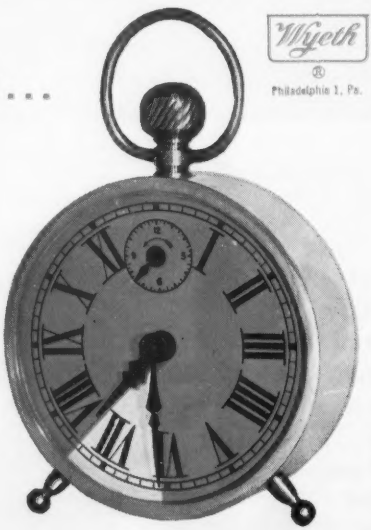

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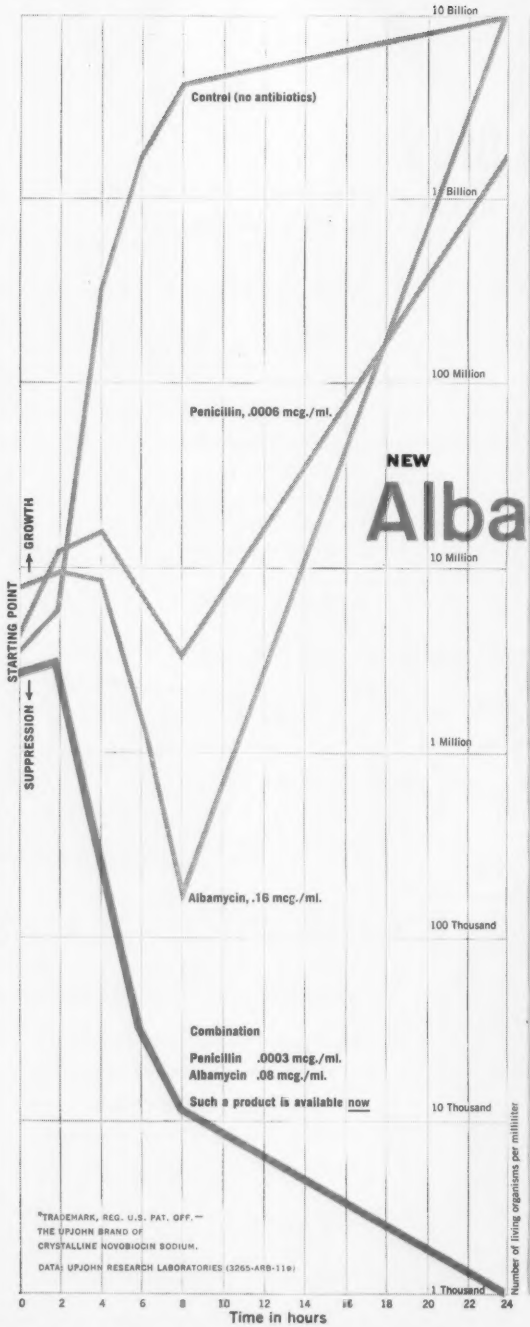
1. Vilter, Richard W., Am. J. Clin. Nut., 3:72, Jan.-Feb., 1955



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The three gray lines of this graph show the growth rate of a penicillin-sensitive strain of Staphylococcus (Micrococcus pyogenes, var. aureus) under 3 conditions:

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1. Blanchard, K., and Ford, R. A.: Journal-Lancet 74:443, 1954.
2. Blanchard, K., and Ford R. A.: Rocky Mt. M. J. 52:278, 1955. 3. Cass, L. J., and Frederik, W. S.: Am. Pract. & Dig. Treat. 2:844, 1951.

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Manufacturers' Activities . . .

(Continued from page 53A)

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Schering Contest Winners Announced

Established in 1940 by the Schering Corporation, Bloomfield, New Jersey, this contest annually offers prizes to medical students for the best papers on three selected medical topics of current interest. This year's winners of the first prize of $500 cash award are Nathaniel Silon of Albany Medical College, who wrote on "New Applications of Antihistamines in Medicine and Surgery;" Marvin I. Gottlieb of the University of Tennessee School of Medicine, whose subject was "Metabolic Aspects of the Aging Process;" and Richard K. B. Ho of the University of Maryland Medical School, whose topic was "The Clinical Use of Adrenocortical Steroids in Collagen Diseases."

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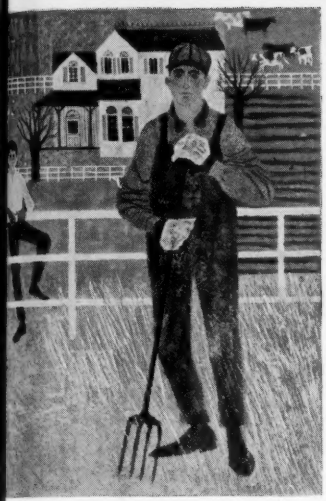

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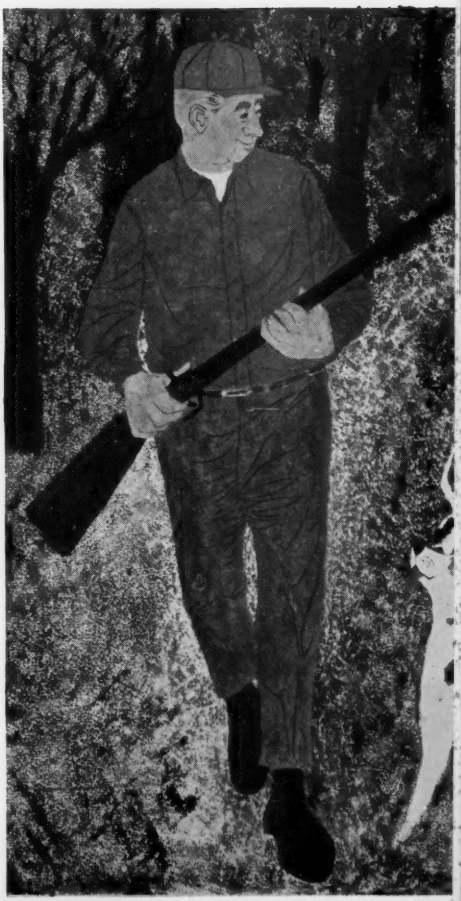

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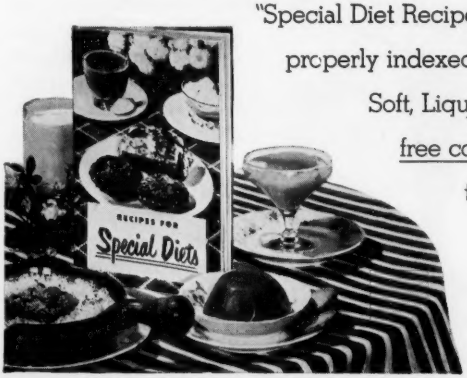

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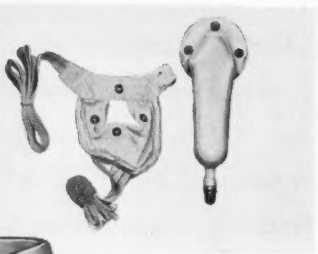


Hanna "Featherweight" Drip Urinal
No. 8—Male Adult
Ideal for slight incontinence. Removable closure cap, adjustable waistbelt. Soft cotton-cloth suspensory, light latex top. Easy to adjust. Latex conical-shaped penile sheath.

Available through your surgical supply dealer.

The Hanna Urinal by DAVOL®

Most comfortable urinal ever designed. Special Davol construction assures maximum patient comfort and security — sitting, standing or lying down — during day or night use. Incontinent patients will welcome these features: the Hanna Urinal is lightweight; cotton-cloth waistbelt suspensory and support make it cool, easy to wear, to wash, to adjust.

DAVOL® RUBBER COMPANY
Providence 2, R. I.

MAKERS OF FINE RUBBER SURGICAL GOODS FOR OVER 82 YEARS

ONE OF A COMPLETE LINE OF VITAMIN PRODUCTS
Lederle
FORMULATED UNDER RIGID QUALITY CONTROL FOR YOUR PRESCRIPTION NEEDS

Signs of a single B vitamin deficiency are regarded by nutritionists as evidence of lack of multiple B-complex elements and an indication for B-complex therapy.

Despite similarity of published formulas, B-complex multivitamin preparations may differ in potency. Specify LEDERPLEX and assure your patient a preparation conforming to highest professional standards.

The entire vitamin B-complex (folic acid and B_{12} included) is offered in highly potent form. The palatable orange flavor of LEDERPLEX is taste-true, does not "wear thin" or go "flat" on prolonged dosage.

seldom seen singly

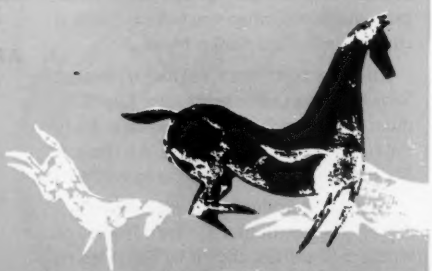
Each teaspoonful (5 cc.) of LEDERPLEX LIQUID *contains:*

Thiamine HCl (B_1)	2 mg.
Riboflavin (B_2)	2 mg.
Niacinamide	10 mg.
Folic Acid	0.2 mg.
Pyridoxine HCl (B_6)	0.2 mg.
Pantothenic Acid	2 mg.
Choline	20 mg.
Inositol	10 mg.
Soluble Liver Fraction	470 mg.
Vitamin B_{12}	5 mcgm.

Also available in tablet, capsule and parenteral forms.

LEDERPLEX*

VITAMIN B COMPLEX LEDERLE



Lederle LEDERLE LABORATORIES DIVISION, AMERICAN CYANAMID COMPANY, PEARL RIVER, NEW YORK

*REG. U. S. PAT. OFF.

Typical Sanka Booth At Medical Conventions All Over The Country

Remember how much you enjoyed it?

You can be sure your patients will, too!

"Instant Sanka is *real* coffee—*delicious* coffee!" That's what you said at the medical conventions, when you tasted your first cup at the Instant Sanka booth.

And how right you are, Doctor. Instant Sanka is *not* a coffee substitute. It's 100% pure coffee—rich and full-bodied. Only the caffein has been removed. All the satisfying flavor is there for you to enjoy.

Why not introduce your patients to satisfying Instant Sanka Coffee? If they're sensitive to caffein, they'll be delighted to learn they don't have to give up coffee—not if they switch to Instant Sanka Coffee because Instant Sanka is 97% caffein-free.

All pure coffee...
97% caffein-free

Product of General Foods

Clinical Reviews . . .

MAYO CLINIC
and
MAYO FOUNDATION

ROCHESTER, MINNESOTA

April 1, 2 and 3, 1957

● Staff members of the Mayo Clinic and the Mayo Foundation for Medical Education and Research will present again this year a three-day program of lectures, discussions and demonstrations on problems of current interest in general medicine and surgery.

Up to twenty-one hours of Category I credit may be obtained by American Academy of General Practice members who attend.

There are no fees for this program.

The number of physicians who can be accommodated is necessarily limited. Those wishing to attend should communicate with Mr. R. C. Roesler, Mayo Clinic, Rochester, Minnesota.

Correct
constipation . . .
Restore
HABIT TIME
of bowel
movement

PETROGALAR®
Aqueous Suspension of Mineral Oil, Plain

Wyeth®
Philadelphia 1, Pa.

Bottles of 1 pint

Thoughts only for others...

The homemaker needs help from the doctor and from nutrition and health educators . . . to realize the importance of building and maintaining her own health as well as that of her family.

Many women whose diets are of poor nutritional quality complain of minor ailments and constant fatigue . . . suffer from various chronic diseases . . . and are overweight from lack of exercise. Research has shown that omission of breakfast is often associated with mid-morning fatigue . . . drop in blood sugar levels . . . decreased work output . . . and decreased efficiency of protein utilization. Even appetite is more difficult to control.

Surveys show homemakers often have poorer eating habits than their husbands and children . . . than employed women of comparable income. Skipping breakfast . . . having just coffee for morning or noon meal . . . and low level of milk consumption are common dietary faults of homemakers. A good breakfast which includes milk or other source of high quality protein can help promote pep and energy throughout the day, by preventing fall in blood sugar levels.

Three glasses of milk a day . . . to drink . . . used in food preparation . . . as cheese, or ice cream . . . will provide the calcium needs of women . . . and supply generous quantities of high quality protein and other essential nutrients.

In planning meals for the homemaker, and for the woman who works, *milk and milk products are foundation foods for good eating and good health.*

The nutritional statements made in this advertisement have been reviewed by the Council on Foods and Nutrition of the American Medical Association and found consistent with current authoritative medical opinion.

Since 1915 . . . promoting better health through nutrition, research and education.

NATIONAL DAIRY COUNCIL
A non-profit organization
111 N. Canal Street • Chicago 6, Ill.

THIS ADVERTISEMENT IS ONE OF A SERIES. REPRINTS ARE AVAILABLE UPON REQUEST

Effective local treatment

FOR BEDSORES AND OTHER CHRONIC ULCERATIONS

May 15th. Severe decubitus ulcer over femoral greater tuberosity in a terminally ill patient.

WHITE'S VITAMIN A & D OINTMENT

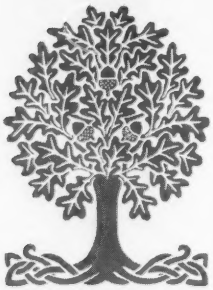
Routine application of White's Vitamin A & D Ointment promotes granulation and epithelization in *stubborn bedsores, chronic ulcers of varied etiology, burns and slow-healing wounds* that do not permit primary surgical closure. It is also useful as a protective and therapeutic covering in miscellaneous skin conditions characterized by abnormal dryness. White's Vitamin A & D Ointment provides vitamins A and D in a pleasant lanolin-petrolatum base that does not stain tissues or bed clothes.

℞ in 1½ oz. or 4 oz. tubes;
1 lb. or 5 lb. jars.

July 12th. After 2 months of treatment with White's Vitamin A & D Ointment, ulcer crater reveals healthy granulation tissue

White's

WHITE LABORATORIES, INC., KENILWORTH, N. J.



You are cordially invited to attend

THE THIRD ANNUAL MERRELL SYMPOSIUM

Constructive Medicine in Aging: Cardiovascular Disorders in the Aged

Thursday, January 17, 1957, 9:30 A.M. to 5:00 P.M.
Hall of Mirrors, The Netherland Hilton, Cincinnati, Ohio

PROGRAM

Johnson McGuire, Professor of Clinical Medicine and Director of Cardiac Laboratory, University of Cincinnati College of Medicine, will serve as moderator for the Symposium

K. J. Franklin, The Medical College of St. Bartholomews Hospital, London.
INVESTIGATION OF WHAT IS CONSIDERED NORMAL FOR THE AGING CARDIOVASCULAR SYSTEM

J. Earle Estes, Jr., Mayo Clinic, Rochester, Minnesota.
VENOUS DISORDERS IN OLDER PEOPLE

Walter S. Priest, Associate Professor of Medicine, Northwestern University School of Medicine, Chicago.
ANTICIPATION AND MANAGEMENT OF CARDIAC DECOMPENSATION

Jessie Marmorston, Professor of Experimental Medicine, University of Southern California, Los Angeles.
HORMONAL ASPECTS OF MYOCARDIAL INFARCTION IN FEMALE AND MALE SUBJECTS

Ancel Keys, Professor of Physiology and Director of Laboratory of Physiological Hygiene, University of Minnesota, Minneapolis.
CALORIES AND CHOLESTEROL

Robert W. Wilkins, Professor of Medicine, Boston University School of Medicine, Boston.
DRUG THERAPY FOR HYPERTENSIVE VASCULAR DISEASE IN PATIENTS PAST MIDLIFE

Robert A. Bruce, Associate Professor of Medicine, University of Washington School of Medicine, Seattle.
EVALUATION OF FUNCTIONAL CAPACITY IN PATIENTS WITH CARDIOVASCULAR DISEASE

Edward J. Stieglitz, Consultant in Geriatrics, Veterans Administration and St. Elizabeths Hospital, Washington, D. C.
INTEGRATED UNITY OF THE PATIENT

This Third Annual Merrell Symposium is presented as a service to the medical profession, an important part of Merrell's continuing program of Research in Gerontology.

Merrell
Since 1828

THE WM. S. MERRELL COMPANY New York • CINCINNATI • St. Thomas, Ontario

Emergency: acutely agitated patient

You are ready with SPARINE in your bag to cope promptly with acutely agitated patients. SPARINE offers immediate action to quiet hyperactivity and to facilitate cooperation. *Always carry it.*

SPARINE is well tolerated on intravenous, intramuscular, or oral administration. Toxicity is minimal—no case of liver damage has been reported. Parenteral use offers (1) minimal injection pain; (2) no tissue necrosis at the injection site; (3) potency of 50 mg. per cc.; (4) no need of reconstitution before injection.

Professional literature available upon request.

Wyeth®
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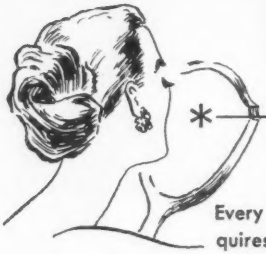
Sparine*

HYDROCHLORIDE

Promazine Hydrochloride — *10-(γ-dimethylamino-n-propyl)-phenothiazine hydrochloride*

*Trademark



*what she sees here... depends on you!

Every woman wants to look her best — whether her best requires a complete beauty regimen or only a scrubbed face — a puff of powder — and a touch of lipstick. To be deprived of her make-up — the "face" which she artfully arranges to meet the world—is, at least, disconcerting.

Women need cosmetics that cleanse—lubricate—freshen—and beautify—just as they need your help to correct skin problems. In instances where regular make-up can not be allowed—don't forbid all beauty products—for Allercreme Hypo-allergenic Cosmetics may prove to be precisely right. Carefully formulated—"pharmaceutically" compounded—exquisitely packaged—they are apt to please both you and your most particular patient.

Formulary—test kit—samples —and sources of supply are yours upon request.

*Allercreme

HYPO-ALLERGENIC COSMETICS

Div. of Texas Pharmacal Company, P. O. Box 1659, San Antonio, Texas

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great expectations for

hypertensives

VASCUTUM Improved. Each Capsule contains:

Choline bitartrate	349 mg.
Inositol (anhydrous)	167 mg.
dl-Methionine	84 mg.
Pyridoxine HCl	0.87 mg.
Quercetin	15 mg.
Ascorbic acid	12.5 mg.
Vitamin B_{12}	2 mcg.

VASCUTUM® IMPROVED

the only lipotropic-antihemorrhagic with Quercetin

- Quercetin corrects capillary fault, important contributor to mortality in hypertensive disease[1,2]
- High-potency lipotropics decrease mortality when hypercholesterolemia complicates degenerative vascular disease[3]
- Reduces excessive mortality rate of hypertensives by as much as 76%[1,2,3]

Suggested dosage: One capsule q.i.d.

Supplied: Bottles of 100 and 1,000 hard gelatin capsules.

1. Griffith, J. Q., Jr.; Nagaski, J., and Krewson, C. F.: Rutin and Related Flavonoids, Easton, Pa., Mack Publishing Co., 1955.
2. Griffith, J. Q., Jr.; DeEds, F.; Nagaski, J., and Krewson, C. F.: A.M.A. Arch. Int. Med. 94:1037, 1954.
3. Griffith, J. Q., Jr.: M. Clin. North America 38:1717, 1954.

VASCUTUM IS THE REGISTERED TRADEMARK OF SCHENLEY LABORATORIES, INC., FOR ITS LIPOTROPIC-ANTIHEMORRHAGIC PRODUCT.

SchenLabs SCHENLEY LABORATORIES, INC.
New York 1, New York

PATIENTS ON "MEDIATRIC" CAN EXPECT A HEALTHIER, HAPPIER "SECOND FORTY YEARS"

Steroid-Nutritional Therapy Provides a Constructive Approach in Preventive Geriatrics

"MEDIATRIC"®

AYERST LABORATORIES
New York, N.Y. • Montreal, Canada
5659

For geriatric patients with delicate digestions

Wheatena is so *digestible* it can easily be taken by many infants three months old. Made by toasting together the wheat heart, farina and bran, this all wheat cereal is very carefully processed at every stage to keep it pure and wholesome.

Wheatena is so *delicious* that it tempts your patients to eat breakfast. And Wheatena is manufactured without salt or sugar.

Digestible, delicious—that's Wheatena. Write for your *free* sample of Wheatena. Suggest Wheatena to all your patients.

The Wheatena Corporation
Rahway, N. J.

Wheatena *Tastes Good!*

time has no tag on them

Spirited senior citizens—healthy, happy, active—are a delight to see . . . and be with. Many doctors include GEVRAL in the medical management of these individuals. For GEVRAL is an important word—specifying comprehensive diet supplement for people past 40. Each *dry-filled* capsule provides 14 vitamins, 11 minerals, and Purified Intrinsic Factor Concentrate. Convenient and economical: only one capsule daily. Start GEVRAL supplementation early.

GEVRAL*

VITAMIN-MINERAL SUPPLEMENT LEDERLE

Other Lederle geriatric products include GEVRABON* Vitamin-Mineral Supplement Liquid with a sherry flavor; GEVRAL* PROTEIN Vitamin-Mineral-Protein Supplement Powder; and GEVRINE* Vitamin-Mineral-Hormone Capsules.

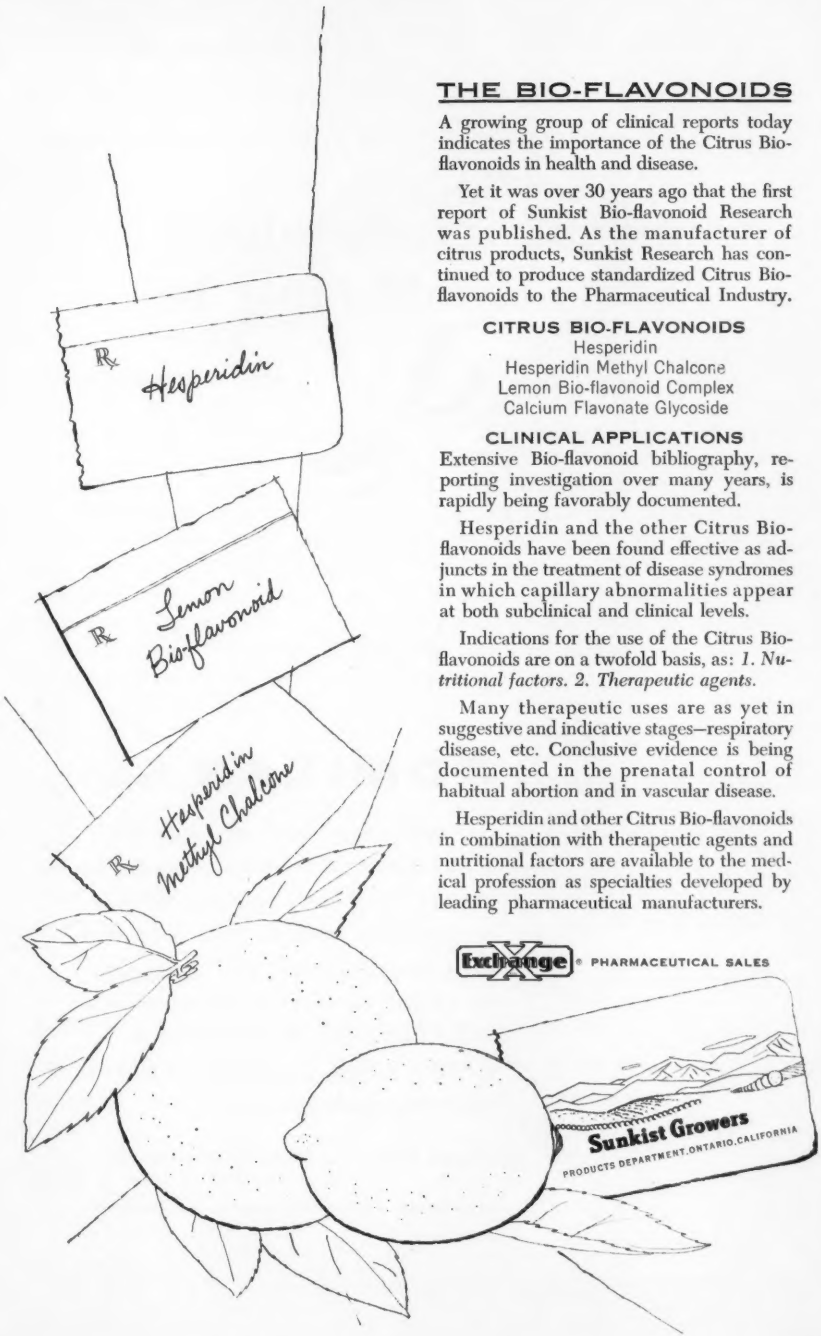
Each GEVRAL *capsule contains:*

Vitamin A	5000 U.S.P. Units
Vitamin D	500 U.S.P. Units
Vitamin B_{12}	1 mcgm.
Thiamine Mononitrate (B_1)	5 mg.
Riboflavin (B_2)	5 mg.
Niacinamide	15 mg.
Folic Acid	1 mg.
Pyridoxine HCl (B_6)	0.5 mg.
Ca Pantothenate	5 mg.
Choline Bitartrate	50 mg.
Inositol	50 mg.
Ascorbic Acid (C)	50 mg.
Vitamin E (as tocopheryl acetates)	10 I. U.
l-Lysine Monohydrochloride	25 mg.
Rutin	25 mg.
Purified Intrinsic Factor Concentrate	0.5 mg.
Iron (as $FeSO_4$)	10 mg.
Iodine (as KI)	0.5 mg.
Calcium (as $CaHPO_4$)	145 mg.
Phosphorus (as $CaHPO_4$)	110 mg.
Boron (as $Na_2B_4O_7.10H_2O$)	0.1 mg.
Copper (as CuO)	1 mg.
Fluorine (as CaF_2)	0.1 mg.
Manganese (as MnO_2)	1 mg.
Magnesium (as MgO)	1 mg.
Potassium (as K_2SO_4)	5 mg.
Zinc (as ZnO)	0.5 mg.

LEDERLE LABORATORIES DIVISION, AMERICAN CYANAMID COMPANY, PEARL RIVER, NEW YORK

Lederle

*REG U S PAT OFF.



THE BIO-FLAVONOIDS

A growing group of clinical reports today indicates the importance of the Citrus Bio-flavonoids in health and disease.

Yet it was over 30 years ago that the first report of Sunkist Bio-flavonoid Research was published. As the manufacturer of citrus products, Sunkist Research has continued to produce standardized Citrus Bio-flavonoids to the Pharmaceutical Industry.

CITRUS BIO-FLAVONOIDS

Hesperidin
Hesperidin Methyl Chalcone
Lemon Bio-flavonoid Complex
Calcium Flavonate Glycoside

CLINICAL APPLICATIONS

Extensive Bio-flavonoid bibliography, reporting investigation over many years, is rapidly being favorably documented.

Hesperidin and the other Citrus Bio-flavonoids have been found effective as adjuncts in the treatment of disease syndromes in which capillary abnormalities appear at both subclinical and clinical levels.

Indications for the use of the Citrus Bio-flavonoids are on a twofold basis, as: *1. Nutritional factors. 2. Therapeutic agents.*

Many therapeutic uses are as yet in suggestive and indicative stages—respiratory disease, etc. Conclusive evidence is being documented in the prenatal control of habitual abortion and in vascular disease.

Hesperidin and other Citrus Bio-flavonoids in combination with therapeutic agents and nutritional factors are available to the medical profession as specialties developed by leading pharmaceutical manufacturers.

Exchange® PHARMACEUTICAL SALES

a true
cough specific
non-narcotic

ROMILAR 'Roche'

For suppressing cough, whatever the cause, Romilar is at least as effective as codeine. Yet it has no general sedative or respiratory-depressant activity, and it's remarkably free of side effects such as nausea, constipation, or tendency to habit formation. Available as a syrup, in tablets, or expectorant mixture (with ammonium chloride).

ROCHE *Original Research in Medicine and Chemistry*

Romilar® hydrobromide — brand of dextromethorphan hydrobromide

It has been proposed to the publishers of Geriatrics that the journal institute and carry as a regular feature a

Professional Directory of Rest Homes

The thought is that these "cards," of name and address of the home together with that of the administrator or medical director and ten to fifteen words covering location, accessibility, facilities and type of patients invited, published as a national directory, would prove a convenience to physicians majoring in the care of the elderly and serve the proprietors of such homes by keeping their names before such physicians in a dignified, ethical manner for quick reference.

However, to be of real service only such residences would be acceptable as would be of known excellence as to personnel and premises and uphold and maintain high standards of performance. The only individual capable of drawing with validity conclusions of this nature as to grade and entitlement, is the reputable physician of the community. We don't want to waste our fire and we don't want to receive applications from homes that cannot be listed, thus embarrassing us and the applicant. Therefore we ask our subscribers to nominate homes in their own and neighboring towns to which we may send a questionnaire the filling out of which will disclose size, accommodations, convenience of access, experience, physical equipment, standing of members of staff and other pertinent information looking toward an evaluation.

Thank you very much for your cooperation in the cause of geriatric service in America.

The PUBLISHERS

GERIATRICS, 84 S. 10th St., Minneapolis, Minn. Date.....

I suggest as eligible to be solicited for an advertisement in your professional directory of rest homes, ... in the city of .....

..... at ..... (street address) Responsible person to whom to write is .....

Signed .....M.D.

Street..... City..... State.....

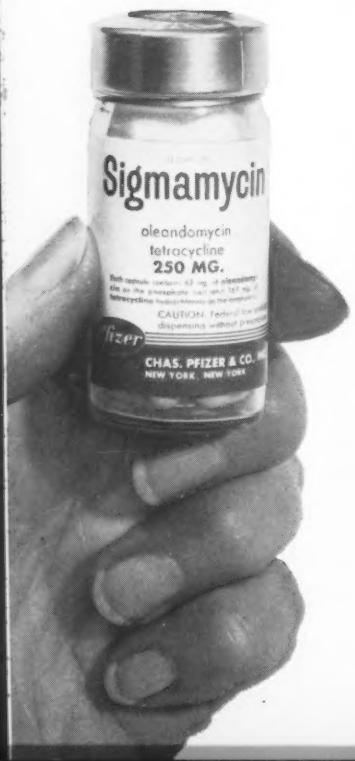
I am affiliated with ☐ Medical Society ☐ Hospital ☐Medical School.

for added certainty

in antibiotic therapy...

multi-spectrum†
synergistically
strengthened

Sigma



†the antimicrobial spectrum of tetracycline extended and potentiated to include even those strains of staphylococci and other pathogens resistant to previously employed antibiotic therapy; and to provide

1. a new maximum in therapeutic efficacy

2. a new maximum in protection against resistance

3. a new maximum in safety and toleration

Capsules: 250 mg. (oleandomycin 83 mg., tetracycline 167 mg.)

Pfizer *World leader in antibiotic development and production*

*Trademark

plus a new maximum in palatability... *now available with new mint-flavored*

amycin*

OLEANDOMYCIN TETRACYCLINE

for ORAL SUSPENSION

A savory mint flavor that adds the further certainty of acceptability to antibiotic therapy, particularly for that 90% of the patient population treated in the home or office where sensitivity testing may not be feasible, and where pleasant flavor can make the difference between prescription adherence and laxity.

Sigmamycin for Oral Suspension is available in 2 oz. bottles containing 1.5 Gm. of Sigmamycin (oleandomycin 500 mg., tetracycline 1 Gm.). When reconstituted each 5 cc. teaspoonful contains 125 mg. of Sigmamycin (42 mg. of oleandomycin as the phosphate salt with tetracycline amphoteric equivalent to 83 mg. of tetracycline hydrochloride).

PFIZER LABORATORIES, Brooklyn 6, N.Y.
Division, Chas. Pfizer & Co., Inc.

For the Aged and Senile Patient

ORAL *Metrazol*

— to help the geriatric patient with early or advanced signs of mental confusion attain a more optimistic outlook on life, to be more cooperative and alert, often with improvement in appetite and sleep pattern.
Metrazol, a centrally acting stimulant, increases respiratory and circulatory efficiency without over-excitation or hypertensive effect.

Dose: 1½ to 3 grains, 1 or 2 teaspoonfuls Liquidum, or the tablets, every three or four hours.

Metrazol tablets, 1½ grs. (100 mg.) each. Metrazol Liquidum, a wine-like flavored 15 per cent alcoholic elixir containing 100 mg. Metrazol and 1 mg. thiamine HCl per teaspoonful.

Metrazol®, brand of pentylenetetrazol, a product of E. Bilhuber, Inc.

BILHUBER-KNOLL CORP. *distributor* — **ORANGE NEW JERSEY**

The last straw ...a dry, sensitive skin

A taut, chafed skin — alone or accompanying other more serious problems — can become a distracting discomfort to any patient — young or old — ambulatory or bedfast. Keep dry skin from adding an insupportable "last straw" to your patients' burdens — with Lubriderm — a time-tested skin lubricant — capable of brightening a person's entire outlook in minutes.

Non-greasy, non-staining Lubriderm contains cholesterol derivatives of lanolin in a formula so bland, so soothing, so effective — that it often smooths away a dry skin problem in only a few applications. If you would like a complimentary supply sufficient to introduce Lubriderm to several of your patients, send your request now.

LUBRIDERM®

TEXAS PHARMACAL CO. — *for distinctive dermatologics*
P.O. BOX 1659 SAN ANTONIO, TEXAS

More than just a "toast"

to good health...

In the light of recent research,* the traditional raising of a glass of good cheer—"To Your Good Health"—has become more than just a symbol of good fellowship.

Wine, one of the most ancient of dietary beverages, now takes on added lustre as a natural-source therapeutic adjuvant in many back-to-health programs.

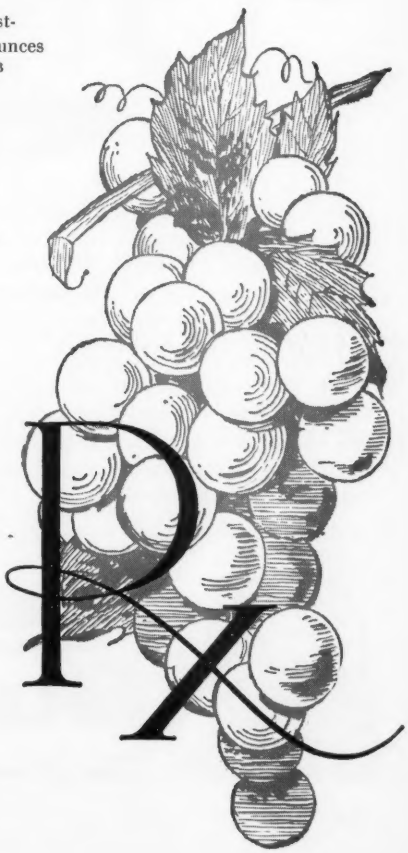
Wine in Anorexia—In the dietetic management of the post-surgical, convalescent or geriatric patient, two to three ounces of dry table wine has been found to stimulate appetite[1,2,3] and increase caloric intake.[4]

Wine for Gentle Sedation—Described as the safest of all sedatives, wine can be used to dispel the fears and anxieties of old age and of prolonged illness. The judicious use of dessert wine at bedtime can often induce normal sleep without the use of drug medication.

Wine to Brighten the Sick Tray—In the dull and often unappealing dietary regimen of many patients, a glass of wine can frequently provide a touch of interest and "elegance"—a psychological boost of inestimable value—and for just a few cents a day.

The Flavorsome Fine Wines of California—The fine wines of California are delicious, and the variety is so wide that a wine can be found to suit individual taste.

*Uses of Wine in Medical Practice, published by Wine Advisory Board, 717 Market Street, San Francisco, California.



1. Goetzl, F.R.: Permanente Found. M. Bull. *8*:72 (April) 1950.

2. Irvin, D.L., and Goetzl, F.R.: Permanente Found. M. Bull. *9*:119 (Oct.) 1951.

3. Irvin, D.L.; Durra, A., and Goetzl, F.R.: Am. J. Digest. Dis. *20*:17 (Jan.) 1953.

4. Goetzl, F.R.: A Note on the Possible Usefulness of Wine in the Management of Anorexia, unpublished.

1 tablet q. 12 h.: to prevent angina pectoris:

Provides full 24-hour protection for 8 out of 10 angina patients: In rigorous clinical trials,[1] METAMINE SUSTAINED improved 80 (78%) of 103 patients with angina pectoris, including a group refractory to other medication.

Each METAMINE SUSTAINED tablet slowly releases 10 mg. of METAMINE, the unique, amino nitrate, to provide lasting, 12-hour protection from attacks of angina pectoris.

Simplified dosage—just 1 tablet on arising, and 1 before the evening meal.

Greater economy for your patient with angina pectoris.

Supplied: METAMINE SUSTAINED, 10 mg., bottles of 50 sustained-release tablets. Also available: METAMINE, 2 mg., in bottles of 50 and 500, and METAMINE (2 mg.) with BUTABARBITAL (¼ gr.), bottles of 50 tablets.

[1]Fuller, H. L. and Kassel, L. E.: Antibiotic Medicine and Clinical Therapy, 3:322, October 1956.

Metamine®
triethanolamine trinitrate biphosphate, LEEMING, 10 mg.
Sustained

Thos. Leeming & Co. Inc. 155 E. 44th St., NEW YORK 17, N.Y.

***For hypertension*—helping the hypertensive to help himself**

THEOMINAL® R.S.

(Theominal with Rauwolfia serpentina)

■ ***synergistic antihypertensive relaxant***

THEOMINAL—Theobromine (320 mg.) and Luminal® (10 mg.)—The peripheral vasodilating, sedative and central antihypertensive effects of Theominal gradually reduce blood pressure to more nearly normal levels.

Rauwolfia Serpentina alkaloids (alseroxylon) 1.5 mg.* — The cumulative hypotensive effect of the Rauwolfia serpentina is preceded by a tranquilizing action which produces a feeling of well-being in the patient.
Theominal R.S. is well tolerated.

DOSAGE: 1 tablet two or three times daily. When improvement has been maintained for a time, the dose may be reduced or medication suspended occasionally until its resumption is indicated.

SUPPLIED: Bottles of 100 and 500 tablets.

* = 0.3 mg. reserpine in activity

Winthrop LABORATORIES • NEW YORK 18, N. Y.

Theominal and Luminal (brand of phenobarbital), trademarks reg. U.S. Pat. Off.

LOCAL ESTROGEN APPLICATION GREATLY SIMPLIFIES TREATMENT OF SENILE VAGINITIS

THIS method provides an "almost immediate healing and soothing effect" Doyle reports,[1] and "is a valuable therapeutic constituent in the management of vaginitis and vaginal infections, regardless of etiology."[2] This worker employed "Premarin" Vaginal Cream applied locally and found it "superior" to the use of suppositories. There were none of the "side-effects frequently noted with synthetic products . . ."[1]

Favors Rapid Healing in Vaginal Surgery

In plastic vaginal surgery in the postmenopausal patient, local estrogen application prior to and after intervention will restore the atrophic and friable mucosa to a more youthful state by promoting proliferation and vascularity of the epithelium. This will facilitate the surgical procedure as well as favor more rapid healing.[2,3]

"PREMARIN" VAGINAL CREAM in a nonliquefying base, is standardized in terms of the weight of active, water-soluble estrogen content expressed as sodium estrone sulfate (0.625 mg. per gram). Presented in a combination package No. 874 — 1½ oz. tube with specially designed calibrated applicator; also refill available. Complete information may be obtained by writing to Ayerst Laboratories, 22 East 40th Street, New York 16, N. Y.

1. Doyle, J. C.: California Med. *71*:15 (July) 1949. • 2. Doyle, J. C.: Urol. & Cutan. Rev. *55*:618 (Oct.) 1951. • 3. Hamblen, E. C., in Stieglitz, E. J.: Geriatric Medicine, ed. 2, Philadelphia, W. B. Saunders Company, 1949, p. 657.

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5650